

**DRIVING FORCES OF SMALL-SCALE GOLD MINING AMONG  
THE NUPKA MAJEDONS: A CROSS-SCALE SOCIOECONOMIC ANALYSIS  
OF PARTICIPATION IN GOLD MINING IN SURINAME**

**By**

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OF PARTICIPATION IN GOLD MINING IN SURINAM**

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Chair: Dr. Ricardo Goody  
Major Department: Anthropology

This dissertation addresses the question: Why do some people become small-scale gold miners, while others do not? Anthropological field research among the Nópika Maroons of Surinam, South America, provides the basis for the analysis. Interviews were conducted with gold miners and non-miners in gold mining camps, forest villages, and Paramaribo. Driving forces of small-scale gold mining are analyzed across spatial scales. The researcher compares qualitative and quantitative methods to collect and analyze data, combining ethnography, participant observation, and decision modeling with econometrics.

Time-series analysis suggests that Nópika miners do not respond to fluctuations in global market prices of gold and oil. When Suriname, high inflation and unemployment encourage gold mining. The impact of national political instability remains ambiguous.

Ethnographic decision modeling indicates that gender and risk shape decisions about gold mining. Nijukwa men are expected to provide the household cash income. Men choose mining because other jobs are not available or pay insufficiently, they lack the education for better work, and mining offers freedom. For men, disappointing experiences in mining and physical instability were the only reasons to not be a gold miner. Only about five percent of Nijukwa miners are women. The study found empirical evidence that children, responsibilities and limited access to money reduce the access of women to mining. The gender bias in mining is perpetuated by gender traditions, gendered objectives, material labour, and the preference of women to not work in the mining area. Female miners were either family breadwinners or joined mining husbands.

Small-scale gold mining incorporates many physical and economic risks. The hypothesis that risk-relevant and valuable skills back-up miners become gold miners was rejected. Rather, miners are generally individuals with many economic dependants and few income options. Risk theory is advanced by showing that male and female miners confront different risks, and by measuring and comparing risk attitudes of miners and non-miners. The research contributes to gender studies by exploring the linkages between gender inequality and access to gold mining. A general lesson from the study is that poverty coupled with the elimination of traditional job options encourages ecologically damaging resource use.

## CHAPTER 1 INTRODUCTION

### Central Question

Why do some people become small-scale gold miners, while others do not? This question is central to my work, and relates to a larger question of why people engage in risky, ecologically destructive behavior. Despite considerable academic concern about the social and ecological disruption produced by gold miners, both small-scale mines and what causes people to participate or not remain poorly understood. Researchers have explained gold mining as a last resort for poor, unemployed, and poorly educated people (Clancy 1990, MacMillan 1993, Naughton 1993, Roepstorff 1996, Schmitz and Wood 1992). Yet few social scientists examine why people who share the same political, socioeconomic, national, and cultural background make markedly different decisions about mining.

I investigate why people participate in small-scale gold mining using data from field research among the Mijakula Maroons of Suriname. The Maroons are descendants of runaway African slaves, who established independent communities in the rainforest. The Mijakula are one of six Maroon groups in Suriname, and are said to be most actively involved in gold mining. In recent years thousands of small-scale gold miners have entered Suriname's portions of the Amazon rainforest, and mining has become the primary

source of subsistence for Ndjuka households. I investigate why small-scale mining boomed in Suriname when it did, and what motivates individual Ndjuka to either become miners or make a living otherwise.

## **Background**

There are good reasons for studying the driving forces of small-scale gold mining. It is estimated that over four million poor people in the Americas live off small-scale gold mining and the surrounding service economy (Spence 1997). In developing countries such as Suriname, small-scale gold mining has been welcomed as a way to provide income for the poorest and tax revenues for the government (J.M. 1996). Anthropologists and sociologists are concerned about mining because it usually harms local people and the natural environment (Carter 1993, MacMurtrei 1998, Slater 1994). In Suriname small-scale gold mining has caused conflict between miners and others (Almeida 1992, Healy 1996), spread malaria (BGO 1997) and sexually transmitted diseases (Antonius-Smit et al. 1999), and degraded the forest ecosystem (DeGooij, VanDerVoort, and DeWit 1998, Pollack et al. 1998).

Understanding the forces that drive gold mining is especially relevant for Suriname. At present small-scale gold mining drives the economy of Suriname and provides subsistence to the poorest segments of its population. However, small-scale gold mining is also the country's main cause of forest degradation. My work is the only mining study on why people in Suriname become small-scale gold miners, and the only recent in-depth study among the Amerindians. Understanding the socioeconomic factors that motivate Amerindians become gold miners is valuable for the design of public policy that encourages more sustainable subsistence strategies in the Suriname Amazon.

My research is also relevant beyond Suriname. The question of why the Nijuka mine for gold relates to broader concerns about the human drivers of environmental degradation (Angeles, Puz and Vellingaers 1994, Gluck and Greckford 1997, Hoot and Cookson 1999, Spence, Bailey and Headland 1999, Painter and Duthrie 1999, Wood et al. 1999). My work also contributes to research on the responses of native people to regional, national, and international developments (Gedajl, Barker and Folke 1999, Godoy, Braken and Wallis 1993, Godoy, Wilkie and Peadar 1997, Hansen and Nielsen eds. 1993, Redford and Padoch eds. 1992, Spence ed. 1992). Within this broad theoretical context I am especially interested in household gender relations and individual attitudes and behavior towards mining risks.

I focus on gender because gender differentiations characterize the Suriname mining population, among the Nijuka only one out of every 10-20 gold miners is a woman. My observation confirms recent United Nations estimates that 10-15% of the world population of small-scale miners are women (UN 1996). I will explain why Nijuka women participate minimally in mining. Because women and men typically have unequal access to power and resources in society (Agnew 1994, Kabeer 1994, Leach, Jackson and Green 1993, Schmitz 1999, Bachdona, Thomas-Slayen, and Wengen 1994), it is likely that male and female options and constraints to enter mining differ.

Researchers before me have analyzed gender inequality in access to resources in two overlapping areas. One group has primarily been concerned with mine household allocation of resources and power (Dean 1998, Dean 1996, Banks 1994, Katz 1991, Koopman 1991, Rodgers and Robinson eds. 1999, Wils 1999). These scholars have exposed the gender bias in the divide of material and human resources within the



household. Other researchers have studied how gender regulates the rights to – and the distribution and use of – the natural environment and ecological resources (Agarwal 1994, Blakes et al. 1994, Haynes 1995, Kabeer 1994, Manzano-Delgado et al. 1997, Roach-Solomon, Thomas-Hopet and Wagoner eds. 1996, Scherink 1995, Udry 1996). My study contributes to theory on gender and resource allocation by directly linking inequality within the household to unequal access to natural resources. I argue that the unequal divide of resources, labor, and power in Níjpekin households limits the options of women to participate in gold mining.

It is also important to focus on women in mining because female labor has received minimal attention in mining studies. Even though several researchers report the presence of women in mining areas (Cleary 1980, Macchiliani 1983, Livi 1996), few have analyzed in-depth why women might enter mining less frequently than men. It also remains unclear if and how the reasons to become a miner and live in the mining area differ between women and men. Rodriguez (1993) describes the lives of women in Dominican mining camps in ethnographic detail, but provides little information about how they compare to male miners. I intend to reveal the differences between male and female decisions about gold mining – and in their lives as miners.

I explore Níjpekin attitudes and behavior towards risk because gold mining incorporates many economic and physical risks: earnings are uncertain and the chances of becoming a victim of muggings or violent crime are high. It is likely that individuals who decide to enter mine or not enter mining consider these risks, but few researchers have rigorously tested how miners perceive and mitigate the risks they confront (Cleary 1980). I will test if theories of peasant risk behavior are robust in a mining environment,

Then I will compare my findings with other studies in an attempt to identify general patterns that influence people's judgments in risky substance scenarios.

### **My Approach**

I take an innovative approach to tackle the research question by integrating traditional anthropological methods with statistical analysis. Some people are concerned that combining ethnography with quantitative analysis will compromise the quality of both methods. Economists are likely critical of the small sample size, limited significance, and econometric problems of the statistical models. Meanwhile the open descriptive and reflective subtextual may discredit ethnographers. While these concerns are valid, I choose to combine methods for the following reasons. First, because it addresses several relatively unexplored questions, it is uncertain which method is most appropriate to provide the best answers. Second, I believe that bridging qualitative and quantitative methods will generate more valuable results than either method in isolation. I hope to show that quantitative methods are valuable to test the relative importance of qualitatively informed ideas, while ethnography can explain the real life meaning of quantitative findings. In doing so, I intend to combine the most and the other perspectives. Third, I expect that the field of anthropology will gain by experimentation with new ways of doing anthropology that may or may not produce a better understanding than traditional ways.

While the lives and perspectives of the Nijpala are central to my work, I also seek to show how larger scale political and economic processes influence the behavior of Nijpala women and communities. Others before me have used qualitative methods to identify links between national and international processes and the substance choices of

local people (Hollist and Brookfield 1982, Schmidt and Wood 1992, Steadie 1993). My analysis is new in providing quantitative evidence for the relative importance of these factors. I depart from most other social science studies on mining by comparing miners with non-miners from the same population. I argue that it will only be possible to identify what motivates small-scale miners by comparing them with a suitable control-group of non-miners.

## Predictions

I will test several hypotheses to identify the socioeconomic factors that encourage gold mining. I present my predictions about the distinct and approximate forces that motivate Ndjaka to become small-scale gold miners in figure 1-1. The arrows in figure 1-1 present relations that I expect to find between driving forces and Ndjaka participation in gold mining. The hypotheses specific to each chapter are listed in those chapters.

At the macro-scale I test what international and national forces influence local decisions about gold mining. International commodity markets partly determine the profitability and attraction of mining. For example, strong connections between the changing gold prices and the mining boom in the Brazilian Amazon (Clercy 1996, MacMillan 1993). Oil prices are likely to influence gold mining because they largely determine the expenses of a small-scale mining operation. I expect that rising gold prices and falling oil prices encourage mining. At the national level I will analyze the impact of political and economic stability and instability in Suriname. A general pattern that appears from case studies elsewhere is that political and economic instability encourage

the unsustainable use of resources by local people (Bluhm and Brookfield 1997, Boko and Desros, *in press*, Pender and Dickson 1995). I expect a positive relation between national instability and the size of the mining population in Suriname.

Macro-scale forces interact with micro-scale dynamics to shape Ndjaka decisions about mining (Figure 1-3). My prior research suggested that two macro-level factors especially impact Ndjaka decisions about gold mining: gender and risk. At the household level I analyze gender inequality in access to mining. I predict that women are denied access to mining by their reduced income, mobility, and asset ownership, and their increased time spent on childcare as compared to men. At the individual level I test if risk attitudes and risk management affect decisions about gold mining. I predict that men likely to participate in mining are the most risk tolerant individuals who are best equipped to mitigate mining risks. Even though I focus on one specific case, I hope that my findings help understand general patterns that underlie the unsustainable use of resources elsewhere, and that my approach may assist other anthropologists who want to study similar questions.

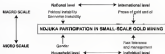


Figure 1-1 Predictors of the forces that drive small-scale gold mining

The arrows in Figure 1-1 present the predicted links between macro and micro-scale forces and the Nguyen participation in small-scale gold mining. The figure indicates that distant and approximate processes as well as processes within each level interact with one another. For example, the two-headed arrow between the household and the individual level shows that being a woman or a man influences one's risk perceptions and ability to acquire risk. It is also likely that substantial risks experienced by the household influence gender relations.

## CHAPTER 2 SURINAME, THE INDIGENAS, MAROONS, AND SMALL-SCALE GOLD MINING

Here I describe the research site, the people in the study, and the context of small-scale gold mining. The information provides the context in which to place the data analysis in later chapters. I begin by summarizing the culture, geography, and political system of Suriname. I continue by describing and justifying the study location and population. Next I describe small-scale gold mining, focusing on both historic and recent developments in gold mining in Suriname. The detailed analysis of the practices and experiences of *Indigena* miners provides a flavor of what life as a gold miner is like.

### Study Site

Suriname, previously Dutch Guiana, is located on the South American continent, north of Brazil between Guyana and French Guiana. The country is small, covering a total land area of 163,000 km<sup>2</sup>. The population of Suriname is estimated to be 400,000 (Alphonso Barros Swinicki 1997). The population is ethnically diverse, being composed of *Indians* (Jamaican Indians, 40%), *Creoles* (people of mixed African descent, 27%), *Javanese* (33%), *Maroons* (18%), *Antilleans* (2.7%), *Europeans* (2%), *Chinese* (1.7%) and several other ethnic groups (Dolan et al. 1998: 6). Of all these groups, almost exclusively the Maroons are working in gold mining. Suriname compares

directly with other Latin American and Caribbean Countries in which mortality (29/1000) and life expectancy rates (women: 71, men: 64) (Population Reference Bureau 1994). The National language of Suriname is Dutch, but many other languages are spoken, including Sranan (the national creole), several Amerindian and Maroon languages, and languages specific to other ethnic groups.

Suriname is rich in natural resources. Relatively small tropical rain forest covers 80% of the country (World Resources Institute 1999). Soils have a texture of sandy loam and clay, and are on the whole unsuitable for agriculture (Dahlberg 1977). The climate is mild but humid, with an average temperature of 27 °C (range 24°C–30°C) and a relative humidity of 78% (Algemeen Bureau Statistiek 1997). Suriname has a modest variation in elevation that reaches a maximum of 1,120 meters above sea level in the Wilhelmina Mountains. Suriname is also rich in minerals. During 1990–994, coal and processed bauxite accounted for 80% of the mineral value of exports (Algemeen Bureau Statistiek 1997). The country's gold deposits are part of the Guiana Shield, a geological province known as Surinam that covers 911,000 km<sup>2</sup> of Venezuela, the Guianas, and Brazil (Varga 1997).

### **Recent Political and Economic Developments**

Suriname became independent from the Netherlands in 1975. The Netherlands granted Suriname 3.5 billion Dutch guilders (1.36 billion in 1995/1996) as start-up money besides development aid. People in Suriname could choose whether they wanted to become Dutch or Suriname citizens (Bakker et al. 1998). Thirty-five thousand people left Suriname in the year of independence (1975) or almost 10% of the population (Tou 1994). In 1995, an estimated 211,000 people of Suriname descent lived in the Netherlands, of whom 162,000 were born in Suriname (Bakker et al. 1998/1999).

After independence Suriname experienced increased unemployment, inflation, ethnic tensions, political strife, socioeconomic inequality, and social discontent (Chakkar et al. 1988; Duddingh 1995). Political and economic instability led in 1980 to the military coup of Sergeant Bouterse. Bouterse stayed in power for 12 years, with the exception of a short interlude between 1987 and 1988. The economic situation worsened when the Netherlands halted payments to Suriname as a reaction to human rights violations by Bouterse's military regime (Duddingh 1995). The national debt tripled between 1982 and 1983, and reached 24-25% of the GDP in 1985. Monetary financing of the debt caused devaluation of the Surinamese guilder; the official exchange rate was artificially held stable at 1.82 Surinamese guilders (SG) to the US dollar, but parallel market rates reached SG 14 to the US dollar in 1987 (Duddingh 1995). In early 1990 parallel market exchange rates had reached SG 1,600 to one dollar (per cent).

In 1988 political repression, economic recession, and a personal conflict led to a guerrilla war known as the *interne oor*. The *interne oor* was fought between the military government and a group of Maroons called the *People's Command*, which received support from Surinamese in the Netherlands (Brama-Route 1998; Polak and Theodor/Wier/Polak 1992; Price 1993). The main leader of the Maroon insurgents, Brameji, was a Nijoka Maroon. Even though many Maroons - including many Nijoka - did not or only halfheartedly support his case, the military government viewed its opponents as the Maroons. Military activity destroyed much of the social, educational, and economic infrastructure in Eastern Suriname where most Nijoka live (Polak and Theodor/Wier/Polak 1992).



Several anthropologists have documented the distrust and dislike that traditionally characterizes the relations between the Maroons and the city population, in particular the Creoles (Lacout 1983, Price 1993, Folsom and Thoden-Habibelson 1992, Thoden-Habibelson 1999). The negativity worsened during the interior war. In Paramaribo I heard city residents refer to Maroons as primitive forest peoples and criminals, hot-tempered, uneducated, and unreliable. Because Creoles held the keys to many wage labor jobs, especially in government offices, Maroons have reduced chances of getting such jobs. Several Maroons with wage labor experience stated that they felt discriminated against and harassed around. It is likely that their marginal position and discrimination partly explain the disproportionate percentage of young Maroons in the national prison population (Guyanese Police Department, pers. com.)

The war stimulated small scale gold mining in several ways. The isolation of the interior from the urban region caused shortages and price increases for people in the forest. Economic hardship coupled with ethnic discrimination decreased subsistence options, leaving gold mining as a matter of survival for many Ndyaka households. The Jungle Commandos also directly stimulated mining, it financed armed struggle with the profits from mining on coordinated river dredges. In 1991 the military government signed a peace treaty with the Jungle Command and held democratic elections. The army was legally removed from politics in 1992 (Gibson et al. 1994). Since then, economic recession, increased inequality, and degradation of the educational and health-care systems have lowered the standard of living of particular the poorest Paramaribo (Algemeen Bureau Statistiek 1993, Bakker et al. 1994, Sheldingh 1993).

## Nijpuka Territory and Sella Creek

I conducted research among the Nijpuka, one of the largest Maroon groups in Suriname. The Nijpuka live in both Suriname and French Guiana, primarily along the Marowijne and Tapachoway rivers, and in the national capital, Paramaribo (figure 2-1). The central Nijpuka village is the town of Dronkiborg where the Nijpuka government is seated. I concentrated my research efforts on the Nijpuka villages along the Tapachoway River. The villages along the Tapachoway typically have between 100-200 inhabitants. I selected Dronkiborg as my field base because the village is accessible by air, and a base-camp for many people traveling to the mining area. I also stayed for several weeks in the village of Moonsik to conduct interviews and observe life in a relatively more isolated and traditional village. My prior personal connections with a schoolteacher in Moonsik motivated and facilitated my stay in this place. In addition, I visited several Maroon villages for one or several days at a time to better understand the variation among Nijpuka villages.

The village of Dronkiborg has a few hundred inhabitants and is more cosmopolitan than the other Nijpuka villages along the Tapachoway River. From Paramaribo the village can be reached by plane in about two hours, and by motorboat canoe in about three days. Dronkiborg has an unaccredited elementary school, a clinic, and hosts the *gouverneur* or paramount chief of the Nijpuka. There is government-driven electricity at night that only works when the government supplies fuel. Facilities in Dronkiborg own televisions, video recorders, and sound-systems, which they run using their personal generators. The people of Dronkiborg are used to outsiders. A man of Dutch origin has lived in Dronkiborg for several decades, and since 1993, two Franco-

Cape volunteers have been stationed in the village. The village also receives regular visits from government officials, migrant miners, and occasional tourists. The village of Moemba is smaller than Derratsibetsa and only accessible by boat. There is a school in the village but no electricity. Few outsiders visit the village.

The area around the Sella Creek is the most mining site where I conducted fieldwork. Sella Creek is a small tributary of the Tapachokop River between the village of Gado-Glo and the more southern Nijaka village Gasa-Dan (Figure 2-1). One reaches Sella Creek traveling by plane or canoe to Derratsibetsa or Gado-Glo, and from there by canoe across the shallow rapids of the Tapachokop River to the creek mouth. In the rainy season it is possible to enter the area by canoe. In the dry-season, miners walk for several hours to reach their camp.

I selected the Sella-Creek site for several reasons. It has the largest concentration of Nijaka gold miners, I had connections from prior fieldwork, and the mining camps in the area are at walking distance from one another. Because of its isolation and the distance of Nijaka miners, Sella Creek also was safe and a field site. Many Nijaka prefer Sella Creek for the presence of law and relatively low incidence of crime. Bushmen dominate the mining population in other mining areas, which decreases social control and given my interest in Nijaka miners, the number of potential interviews.

Nijaka gold miners estimated that there are between 40 and 70 gold mining camps in Sella, which I confirmed by walking through the area. I calculated that these camps house a shifting population of about 700 people. All gold mining in Sella Creek is hand-based. Hydraulic mining machines with two 8-inch pumps were introduced in 1994 and are now the predominant mining method. I estimated the annual gold production of

Sella Creek to be about 1.5 to 2.5 ounces ton, which accounts for 7–11% of the estimated total gold production in Suriname. This share is sufficiently large to ensure that what happens in Sella impacts the trend in small-scale mining in Suriname as a whole.

## Study Population: The Miskito Maroons

### The Maroons

The forest or remote region of Suriname houses and provides sustenance to Amerindians and Maroons who live as small settlements along major rivers. Maroons have lived in the Suriname forest for about five hundred years, since the early days of plantation slavery. Their culture incorporates many elements from diverse African cultures as well as adaptations to the Latin American environment. Today approximately 50,000 Maroons, divided between six different groups, live in Suriname. The greatest differences in language and culture are between the Maroons of central Suriname (Baramaka, Matawai, and Kwinti) and those of Eastern Suriname (Majali, Aluku, and Paramaka). Each Maroon group claims a different territory in the forest, but the Suriname government does not recognize these territories or other types of land rights.

Maroon societies maintain a large degree of political, social, religious, and economical sovereignty (Goldman 1993). The main authority of each Maroon group is the *paramaka*, who directs lower authorities called *kapitama* (captains) who rule over villages or clans. The *paramaka* and *kapitama* are assisted by *jeugts* (councils, police men). The status of Maroon political leaders is legitimated by religious ideology that posits

social behavior and organization (TheodorVat/Vatsoo and VatWetsoog 1991). In theory Maroon authorities are paid by, and act in the service of, the government in Paramaribo. In practice the national government does not regularly pay salaries, and Maroon leaders operate on their own. In recent years women have entered governing positions as well, but the national government does not pay female leaders.

### The Ndjuka

The Ndjuka Maroons, who are also known as Aukwiers, are with the Saramaka the largest Maroon group with an estimated 24,000 members (Price and Price 1999: 16). The Ndjuka appear the most mobile and market-oriented of all Maroons. By the early 19th century, the Ndjuka had settled closer to the urban area, along the Corico and Lower Saramaka Rivers (Figure 3-10). Ndjuka men marketed timber to Paramaribo customers and occasionally grew food for plantations along the coast and for Paramaribo (TheodorVat/Vatsoo and VatWetsoog 1991). Since the 1960s many Ndjuka have moved to Paramaribo, primarily for economic reasons (Lansat 1983). Today, Maroons make up 4.6% of the larger Paramaribo area (Schulzweigt 1994: 21). Most urban Maroons seem to be of Ndjuka origin. If only half of the Maroons in Paramaribo are Ndjuka, then about 10% of the Ndjuka population lives in the city today. The Ndjuka work more in mining than Maroons from other groups.

Kinship, marriage, and residency institutions in Ndjuka society reflect their African heritage. Ndjuka society is matrilineal. The central group of a village consists of the descendants in the female line of an ancestral mother (Giffen 1979). For both sexes matrilineal kin define social divisions and support networks. Ndjuka communities are

polygynous, heavily wealthy men can afford to have more than one wife. The largest number of wives per husband that I observed was three.

Married women typically have a household in their birth-village. Women who share a husband do not live together, even if they are from the same village. Men divide their time and attention between the separate households. Co-wives of one husband may be friends and help one another in daily chores, but women generally resent the existence of multiple wives and/or girlfriends. Women especially dislike being a second or third wife because later wives are inferior to the first wife in the household and have less status in society. Men are supposed to give the first wife preferential treatment, but I observed that men often spend more money on their newly acquired wives. A man favoring newer wives over older ones typically causes conflicts between women. I elaborate on the gender system among the Hôjaka in chapter five and six.

The Maroonas are economically, socially, and politically disadvantaged in Suriname. Quantitative data that expose the marginal position of the Maroonas are sparse, but qualitative evidence is widespread. Maroonas do not fill high positions in either the government or private business. In Suriname, such a lack of personal connections at higher levels poses a barrier to upward mobility. Discrimination, a lack of political consciousness, and low educational attainment undermine the competitiveness of Maroonas in the national job market (Langer 1986; Price 1993; ThodenYbema/Volman 1993). With little access to the formal labor market, most urban Maroonas earn meager and highly variable wages in informal jobs.

## Gold Mining in Suriname

### A Brief History of Gold Mining

Gold mining in Suriname predates the European conquest. The first recorded official exploration occurred in 1718. It was followed by various permits and more efforts to explore and exploit Suriname's gold deposits (Bakkerman 1977). Meanwhile free Caribs and Maroons extracted gold on a small scale. After the abolition of slavery (1863) the Dutch-colonial government encouraged gold exploration to provide employment for former plantation workers. These efforts sparked a gold rush at the turn of the century (1890-1910) (figure 3-2). Attempts to introduce heavier machinery failed during this earlier gold rush due to mechanical problems, improper planning, and erroneous cost calculations (Degenroth and Mayer 1983, DeVletter and Makings 1981).

The production of manual laborers rose steadily throughout the early 1900s, to peak in 1908 at 1,209 kg/yr (figure 3-2). In 1909, 3,531 workers were employed in the mining fields, many of whom were from other parts of the Caribbean (Henderson and Williams 1983). The gold industry collapsed after 1908 due to the lack of management expertise, inefficient exploration, widespread illegality, tensions between workers and concession holders, and the freezing of the gold price on the world market (Goldberg 1984). Gold production declined to less than 2 kg/yr by 1975 (Bakkerman 1977).

Rapidly rising gold prices in the 1970s inspired renewed interest in the gold deposits of Suriname (Goldberg 1979, 1984, Govers 1986). In 1978 the Geological Mining Service of Suriname introduced small surface dredges on the Lawa River, then a new mining technique. However, a paucity of employees and money hampered the

coordination of exploration and exploitation. All governmental geological activity in the interior came abruptly to an end during the interior war (1966–1972). The interior became inaccessible, and the Jungle Command mediated the governmental river dredges. According to local knowledge, the Jungle Command created the first Brazilian miners in Suriname to work on the confederated dredges.

### **Historic Mining Activity Among the Ndjaka**

Ndjaka mined for gold earlier in history but only occasionally, when they needed emergency cash (Joshi 1996). Today it seems that small-scale gold mining has become the primary source of subsistence for a majority of Ndjaka households. During the previous gold rush (1890–1910), Ndjaka navigated goods and people over rivers and rapids to and from mining areas, but they worked here as actual miners (Glabbe/Van Willem and Van Willem 1991). In the 1920s and 1940s women worked manually, with shovels, a pick-axe, a bag, and a baggon. Older miners agreed that they could recover about 18 g of gold/month with these tools. An elderly Ndjaka remembers how gold miners and their families paddled up-river:

In those times you brought your wife and children. You stayed perhaps seven months. The women washed, cooked, sometimes she lay down in her hammock. When she lay down and she got bored, she took a [gold] and she washed gold. We would leave with 40, 50 grams . . . At that time there were not many people, sometimes maybe only five adults. At home you worked alone, other times you worked with another man. If you had a grown-up boy, you could bring him. You found more money then, because there were fewer expenses (young boss, 36).

Today mining has ceased to be a family enterprise and less frequently occurs manually.

### **Gold Mining in Suriname Today**

Today's small-scale gold mining industry in Suriname exceeds all earlier mining activity in technological advancement, gold production, and in the number of miners



Estimates of the number of small-scale gold miners range from 10,000 to 20,000 (Jelle 2017). Miners are dispersed over approximately 20,000 km<sup>2</sup> of Eastern Suriname (Voysa 1987), and are concentrated in several main areas (Figure 2-3). Surinamers, mostly of Maroon descent, are estimated to compose approximately one-quarter of the mining population of Suriname (Voysa 1997). The remaining three-quarters are Brazilian gold miners called *garimpeiros*. *Garimpeiros* have spread over the larger Amazon since the early 1980s when the Brazilian government began to regulate, limit, and control small-scale mining (Jelencich 1985, Schmitz and Wood 1990). *Garimpeiros* said they had left Brazil because there 'every place is a reserve', and the few places that are left to mine are exhausted and overpopulated. They were attracted to Suriname by the relative freedom from bureaucracy, and by exaggerated rumors about its richness. *Garimpeiros* have modernized the small-scale mining industry in Suriname.

### Mining Technology and Production

Most one-day lead-based miners work with hydraulic methods. Appendix C contains a diagram and graphical explanation of their work methods. Tractors and all-terrain vehicles facilitate the transport of supplies to mining camps. More advanced operations use bulldozers, backhoe excavators, and metal detectors, but such equipment had not yet reached Sella Creek. I observed much variation in the efficiency and economic success of small-scale gold mining operations. Miners who work with six-inch pumps typically first mine with six laborers, a boat, and an excavator. In the Sella Creek area, the monthly gold production of such teams ranged between 375 and 3,750 g, averaging 1129 g/month (SD=19, SD=794). The monthly recovery rate was at least five

times higher as the more modern mining operation that I visited along the Luma River. The Luma operation worked with two shifts of 8-7 laborers over 24 hr/day schedule.

Due to its informal structure, estimates of the scale and intensity of the small-scale gold mining industry are speculative. Estimates of annual gold production in Suriname vary from 8 to 42 thousand kg of gold, with a figure of 13,000 kg/yr being cited most frequently (Table 3-1). In 1993-1998, the Central Bank of Suriname (CBS), the institution officially in charge of gold transactions, bought 300-600 kg of gold every month. A senior representative of the CBS estimated that this figure represented 25% of the total amount of gold produced (pers. comm.). This figure is consistent with my findings; only a quarter (25%) of the miners at Sella Creek said they sold gold to legal dealers. Approximately a third of the gold miners in the sample reported selling to Chinese merchants, and another third said to any buyer who paid the highest price.

**Life in the Mining Area**

Life in the mining area is emotionally and physically demanding. The gold miners I interviewed spent, on average, about 7 months a year in Sella Creek (M=6.6, SD=3.8), ranging from a minimum stay of half a month to a maximum of the entire year. During this period, miners live with their mining teams in camps that are a long way from home. In addition to pit workers and a boss, each mining team usually employs a cook, and sometimes others who provide temporary services such as construction, cleaning, or iron work. Figure 3-6 contains a sketch of the base-camp at Sella Creek. Each camp has sleeping tents or shacks, a kitchen, and a well. The base-camp also had a more, luxury sleeping compartments for the boss and the treasurer, as all

mining vehicle, and an encampment area with a latrine and a machine dock. Adjacent camps are from larger clusters that resemble small villages with stores and entertainment.

Many Mincon miners treat their participation in gold mining and the livelihoods of mining life. Rice, beans, raised meat, and bread make up the daily diet. The combination of unbalanced meals and strenuous labor reduces the resistance of miners to disease, such as malaria. To the question "How long do you plan to continue gold mining?" 36% of the miners answered that they wanted to quit as soon as possible (< 1 year). Eleven percent wanted to stay for just a few years (2-4) longer, 49% wanted to quit mining as soon as they found another job, and 18% said they wanted to quit once they had earned enough money to start another enterprise. Only one fifth (22%) of the miners wanted to continue mining for long.

### The Economics of Small-Scale Gold Mining

In the mining economy, men and women perform different jobs that partially overlap (table 3-2). Most men are job-workers or handymen who carry out, clear forest or set up encampments for different camps. Mincon women in the mining fields primarily work as traveling merchants or cooks, but men also perform these jobs. I observed non-work to be exclusively female. Many Mincon miners combine different jobs. For example, cooks often sell merchandise or wash clothes besides cooking. Overmen may simultaneously be working in the pit, and more successful camp bosses often run a camp store.

All monetary transactions occur in gold, but there are large differences in payment systems and earnings between and within professional groups (table 3-3). The machine-owner typically supplies food, shelter, and equipment in exchange for 70% of

the recovery. The laborers divide the remaining 80%, which translates to 3% per laborer with one per laborer on the team. Cooks typically receive fixed wages that they may request by performing small services. On paper, shop owners make some of the highest wages. However, because they are usually paid in credit, they usually receive only about half of what they are owed. The earnings of per laborers in Sella Creek varied highly, depending on the efficiency of their operations and the gold content of their work site (Figure 3-3). Among those who reported no income, gold earnings ranged from 13 to 138 g/month, averaging 41 g per person per month, the equivalent of approximately 343 US dollars (50–132, 840–23, excluding three outliers)<sup>4</sup>. A large share of pit-workers (27%) had earned between 20–40 g/month in the month prior to the interview. Over a quarter (27%) had earned less than that, and three per workers (7%) reported earnings of more than 140 g/month. These high wages were earned in a month, not a year, as Sella Creek.

Other researchers who have assessed the earnings of pit workers in Amazonian mining have reported slightly different figures (Table 3-3). The differences in earnings are a product of differences in time, the personal skills of the gold miners, and local environmental factors, such as the content of gold in the soil, water availability, and the depth of gold-bearing layers. Voiga (1997: 8) found higher recovery rates in Surinam a year before I conducted fieldwork. I expect that his figures come from sites where the gold content was higher or the miners worked more efficiently. The more successful mines in Sella Creek match the data of Voiga (1997). It is likely that the low estimates of Clancy (1980) are a product of the date of his fieldwork, which was more than a decade

<sup>4</sup> Three people reported earnings of over 140 g/month. These high incomes had been accumulated in two weeks or in two fixed money-receiving points in mining in Sella Creek. For this reason I exclude them.

helping mine. All these large miners used less profitable mining methods. Healy's (1998) estimates are also based upon less modern techniques and are therefore lower. Bossons, Veronique and Uhl (1998) also report lower figures than I found, but the reasons for this difference are uncertain.

Machine miners invest approximately 10,000 USD to start up an operation (8-inch hydraulic unit). In Serra-Creek they spend on average 600 gram/gold every month to keep the operation going (9-11, 80-120). Despite these expenses, machine miners reported higher savings on average than people in other professions (9-11, mean = 146 gram gold/month, SD=54). These savings ranged from a low of 14 g to over 1 kg/month reported by the most successful pump-boom. Well-to-do machine miners have introduced fun with proton-powered televisions, satellite dishes that bring Brazilian channels, and video recorders to entertain their laborers and those of surrounding camps. Bossons do not avoid these luxuries solely for the entertainment of the workers, many have discovered that wages flow back to bosses who maintain their workers in the evening hours. Bossons, Veronique and Uhl (1998) estimated that Brazilian gold miners spent over 60% of their incomes on alcohol and sex. From my observations and their own reports, miners in Serra Creek seemed, on average, more conservative consumers than their Brazilian fellow-workers. All the same they spent a significant portion of their wages on cigarettes, alcoholic drinks, sex, and other small luxuries that make mining life more bearable.

## Local Mining Rights

The Sarawak government considers the small-scale gold mining practices of Maroons illegal. The Mining law (Chapter E-38, art. 2-45) states:

No person shall carry out mining and related operations other than in accordance with legal provisions related to mining. These mining operations can only be conducted after rights to do so have been granted by the competent authorities mentioned in article 6 (Release of mining affairs). (Government of Sarawak 1986)

Maroon miners usually work without mining rights or permits from 'competent authorities'. They feel it is unnecessary to apply for official permission to work on lands that they traditionally view as theirs. The bureaucratic application procedure is complicated, slow, and believed to favor government allies. Maroons also have little means to meet the legal requirements to have an office in Kuching and to supply the Department of Mining Services with a written report of all exploration and exploration findings every three months (Government of Sarawak 1986).

Despite the absence of governmental regulation, to speak about a 'wild-west' situation (DeVries and Hincapi 1998: 302) simplifies reality. Rules about mining in the mining area exist, but are based on a local system that may be invisible to outsiders. Nijjala authorities have assigned the concession rights to Sella to three Nijjala families or clans. One concession holder and machine owner (56) explains how his ancestors earned concession rights to a segment of the region by being the first settlers:

I do not know the time exactly, it was before I was born, in the early days, before the [gold] mining people [outsiders] came, before the police [JMA, between the colonial government and the Maroons]. Nobody was there. It was full of trees, there were caribou, there big ones that you do not see anymore. — They [the ancestors] came from the west [Singapore]. They passed the Sella Creek mouth, but they did not enter the creek, another family entered. Near Panton [banking place when entering the Sella Creek mining area over land] they made a camp. The ancestors did not know about gold.

Even though many Fijians who work on the consensus of others refuse to pay the 3% consensus fee, the consensus holder has considerable influence on who works where. Furthermore, the fee-collectors between Mjaka owners and strong social control limit the fighting about stakes in Sella. When conflicts do arise, the granaries and the elderly women judge the case, and their voices remain respected by most women.



Figure 3-6. Suriname and the Ndyuka territory along the Tapanahony River with the Selle Creek marking area





Figure 3-2: Estimated Historical Gold Production in Sarawak

**Sources:**

1875-1974: *Malaya-Japan Geological Map Series* (Sheet 22)

1975-1995: *Malaya-Japan Geological Map Series* (Sheet 22)

1996-1999: *Malaya-Japan Geological Map Series* (Sheet 22)



Figure 3-3 East-Timor with the country's main gold mining regions

1 – In and around the Belakopaka Lake. Many mines are situated near the lake, along the road from Panaukhe to Adilukta and Ineremeng. Mining activity is also encountered along the Sato Creek.

2 – In and around the Macuapic river, in particular around the Panaukhe capital of Leqon/Moya.

3 – In and around the Loro River. Benabury provides the main entrance to the mining area in the hinterland.

4 – Upper-Tapanahony region. The research site, Sella Creek, is the primary mining site



Figure 3-4: Schematic map of a mining camp (field base-camp)

Figure 3-4 shows a schematic map of the base-camp during the fieldwork. In this well-developed camp, there is a layout for the food, a storage-room, and a shelter area for the all-terrain vehicle. There is also an entertainment area where miners gather in the evenings and on free days to watch satellite TV, play chess, and buy luxury foods and drinks. The mining pit and the nearest neighboring camp are approximately 5-10 minutes walking away.

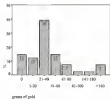


Figure 2-3 Amount of gold (in grams) earned by people who worked primarily as goldworkers (70-82) over the month previous to the interview

Table 2-1 Estimated number of small-scale gold miners and gold production in Tanzania over the past four years by different sources

Source(s)	year	estimated # gold miners x 1000	estimated gold production (metric tons)
La Force Sans manager mining company, Willem Development Co	1999	-	30
Coastal Mining, local Cooperative de Coopération in Pemba	1999	15-18	10-12
Wellman, diamond gold C/Rs	1998	-	24-29
Palmer et al. (1998, unpublished)	1997	15-20	10-20
Varga (1997)	1997	11	8-12
Geomatic, diamond CMO (Kasheva, 1996)	1993	15	10 (gold)
DeKrom, VanDerWest, and DeWaal (1998)	1995	10-15	10

Table 2-2: Payments system and monthly earnings of several professions in Sella Creek

Profession	Payment system(s) observed in the Sella Creek mining area	Monthly net total (g gold)
<i>Jobs performed by women and men</i>		
Buy/Machine owner	60-100% of gold extracted minus production costs (machines, transport of supplies, oil, camp, food)	range 14-180; median: 70
Cook	10 g/gst water-march, or 3 g/gst water-march + 38 g flour/meal, or static wage paid by boss	60 60 15, 30
Shop-owner	Seller minus transport and acquisition costs Products are typically priced 3-10 times the prices in the city	100-600 <sup>1</sup>
Traction vendor	same	range 6-50 median: 18
<i>Jobs exclusively performed by women</i>		
Wash ladies	1 g/perfect	30
Sex-worker <sup>2</sup>	3-5 g/time 8, 18 or 15 g/night (on credit, more expensive)	N/A
<i>Jobs exclusively performed by men</i>		
Transport loader	10 g/ton of oil (100 lbs)	range/avg
Transport All Terrain Vehicle	1-5 g/25 kg transported (cash payment) 3 g/25 kg transported (credit payment)	range/avg
Pit laborers	1% of gold extracted	range 1-150 <sup>2</sup> median: 40
Overman	3% of gold extracted	range 28-300 median: 80
Carter	1 g/40 liter container (1 trip) 30 g/ton of oil (100 l) (8 days)	range 15-180 median: 60
Construction laborer	3% of gold earnings of each operation on far construction (but often not paid)	N/A
All-round carpentry, construction	1 g/wood produced, 15 g for cleaning the camp from weeds, 1 g/m <sup>2</sup> floor covered with steel-rod (large trees and under-story)	N/A

<sup>1</sup> The amount presents the amount sold in cash and credit. Because women frequently do not pay their debts to shop-owners, real profits are much less. The estimate is based upon the information from two men who were exclusively shop-owners. Other shop-owners had other primary jobs such as being a cook or a camp boss.

<sup>2</sup> Figures are median or three authors.

Table 3-3. Estimated earnings of miners (per working or partly) mechanised small-scale gold mining by different countries (per person grams of gold per month)

author(s)	time & place of field work	earnings of per miners (g. of 1 month/yr)
Herzelschke	1978-1979, Bolivia, Suramane	45 (30-75)
Valga (1987)	1987 Suriname	40 - 100
Finley (1996)	1995 Nueva Kallikamp (Koyu Hill), Suriname	partly mechanised (2 <sup>nd</sup> -3 <sup>rd</sup> range) 18 - 30
Reuter, Verheijen and Uhl (1998)	1993 Tapachá Brazil	17 (low power), 15 (medium power), 48 (high power)
Rodrigues (1994)	1998-1997 Tapachá, Brazil	28 (peak)
Clary (1983)	1983-1985, Marabá, Brazil	1.2 - 31

## CHAPTER 3 METHODS AND SAMPLE

Here I describe the general methods of data collection and analysis. I begin this chapter by defining small-scale gold mining and gold miners. I then describe the sampling methods and characterize the sample population. Next I discuss how I generated and analyzed ethnographic data, quantitative data, and archival data. In later chapters I explain the methods pertinent only to those chapters. Definitions of important concepts and foreign words are listed in Appendix B.

### **Definitions**

#### **Small-Scale Gold Mining**

The term small-scale gold mining has been used interchangeably with artisanal mining, traditional mining, informal-sector mining, and *la small* (predecessors (Clancy 1998, MacMillan 1999, Schmitz and Wood 1982, UN 1996). All these terms are used to describe mining that is performed informally with rudimentary methods. I will only use the term small-scale gold mining. Small-scale mining includes both manual mining and mining that makes use of pumps, sluice boxes, and other mechanical equipment.

The Burmese mining law defines small-scale mining as

The reconnaissance, exploration and exploitation of a mineral deposit where surface mode of occurrence and quantity warrants the economic mining by simple means and methods. (Decree 17-88, art. 1-8, Government of Myanmar 1988)

The Geological Mining Service of Myanmar applies the term small-scale mining to mining activity on a concession smaller than 200 ha. These official definitions do not clarify the nature of small-scale gold mining. Therefore I use as a working definition of small-scale gold mining, gold mining that is characterized by

- Informality, large degree of independence of social, legal, and economic regulations implemented by the national government, and
- A labor force that is not formally trained in mining and has a low educational background as general

Even though efficiency and proficiency vary considerably among small-scale gold mining operations in Myanmar, several features characterize all these operations: the absence or low standard of prospecting prior to exploitation, inefficient ore exploitation (extracting and processing) techniques, and high economic and health risks (Bast and Bravinski 1997, Haddy 1996)

### Gold Miners

To answer my research questions I needed to divide the world in gold miners and non miners. Because to my knowledge, no other researchers have clearly defined gold miners or gangmasters, I developed a broad definition of gold miners that best served my research. I use the term gold miner to refer to anyone who is present in the mining camp, and is part of the mining industry or of the surrounding service economy. This definition includes not only pit workers and camp-houses, but also merchants, doctors, and



other people in and around mining camps. It also excludes the spouses of miners who visit the men, because they usually take food to them or come to sell, and perform small services for their husbands and others. It excludes people in the city who invested financially in mining equipment but are not physically present in the mining area.

I found the broad definition of gold miners most useful for several reasons. First, *Mineros* in the mining area typically perform different jobs simultaneously or in sequence. For example, people who were selling or one hour could be found in the mining pit a week later. A narrow definition possibly excluded these people. Second, many mining risks are shared, including malaria, violence, crime, and economic uncertainty. Therefore the most important decision for many Ndjaka is whether to work in the mining area, rather than what job they will do. Several people came without a predetermined workplace; they selected a job in or outside the mining pit once they arrived in the mining area. Third, a narrow definition that only includes pre-workers and buyers excludes most women from the sample of miners. A broad definition of who are gold miners allowed me to investigate gender inequality in access to mining, and to compare non-mining women with female miners.

Throughout the Guinea, local gold miners are called *poducodokors* (*poducodokor*). Historically, this name was used for independent gold miners who worked on the excavations of others in exchange for 10-15% of the gold mined. Today *poducodokor* has a negative connotation and gold miners do not identify themselves by this name. *Mineros* miners refer to themselves as gold miners, the term that I use. I refer to traditional gold miners as *poducodokors*, a name that is commonly used in Guinea.

## Sample

### Sampling Methods

The absence of demographic and socioeconomic data on the Maasai population and the high mobility of male Njirika prevented me from using random sampling stratified by socioeconomic or demographic characteristics. Moreover, a random sample would not generate sufficient variance in the explanatory variables. For example, due to the small number of women in the mining area, a random sample would not include enough female miners to test the hypotheses. Instead I sampled purposively, interviewing the largest number of female miners possible. Purposive sampling allowed me to analyze the differences between female miners and other women, and between female and male miners. I ensured that the final sample was sufficiently varied in age, occupation, age, marital or widowed status, wealth, and other socioeconomic characteristics relevant to testing my hypotheses.

I conducted interviews in the national capital, Parismithe, in forest communities along the Tapashtouy River, and in the Seifu Creek mining area. In Njirika village and in mining camps, I stratified interview candidates by approaching people who appeared unemployed. I asked these people if they were willing to participate in an interview. On other occasions the interview flowed out of a spontaneous conversation with someone. I minimized the bias of representing only the least unemployed persons by making appointments with people who were too busy to participate in spontaneous interviews.

I found opportunities to talk to women while helping out on the land or in domestic efforts. In the mining area, the most productive day of the week was the *kyag*, or

about day. On these days miners were not allowed to work, and often bored and eager to talk. I found other occasions to speak with miners when mining machines had broken down, when people were waiting for the bus, when miners were temporarily out of work or in the case of merchants when there were no customers.

It was more difficult to identify Nijuka in the city because they are one of many ethnic groups, and I could not easily distinguish them from city Creoles or Maroons and other affiliations. Given the tightly connected urban Nijuka community, I found snowball sampling most useful in the city. I started the process from different sources to prevent the sample from including only people from one single network of friends and family. The first person in each sequence was usually someone who I had met incidentally over the course of fieldwork.

### Sample Population

The sample population includes male and female Nijuka who are either gold miners or not gold miners (Figure 3-1). More than half (37.3%) of the interviewees lived along the Tapachobá River in the area called *agü* (up-stream), primarily in the village of Grandbridge and Montaña (Figure 3-2). Another large proportion of Nijuka (37.3%) lived in Panzanchó, and smaller numbers lived in French Guiana (2.3%), *Agü* (down stream) 1.3%, or in the coastal/Cochon region (0.9%). The Nijuka are typically part of multiple households in different places. I classified people on the place where they spent most time.

The men and women in the sample have a similar distribution of ages. About a third (30%) of the people of both sex-groups are between 16 and 25 years of age. A majority of the men (77%) and women (83%), are in their twenties and thirties. Follow-

percent of women and 18% of men are over 50 years of age. Seventy-seven percent of the Mipuka in the sample have a partner. The number of children averages 3.5 (SD=3.6), and ranges from 0 to 26 children. The 26 children belong to a man with three wives who also has children with other women. The number of household members varies widely between 0 and 28, with an average of 4.4 (SD=2.9) people per household.

There are large differences in human capital between Mipuka women and men, as well as between gold miners and others (table 3-7). Table 3 only report the significant differences unless indicated otherwise. The large standard deviations imply that there is much variation within each sex and occupational group. On average, women complete only 3.3 years of formal education and men 5.4 years ( $t=4.50$ ,  $p<0.001$ ). Almost half of the women (48%) and a fifth of the men (20%) have no formal education ( $\chi^2=29.47$ ,  $p<0.001$ ). Among both men and women, gold miners are more highly educated than non-miners but these differences are not significant at the 5% level. Almost none of the interviewees' parents, 7% of fathers and 9% of mothers, had received any formal education.

Almost all men (94%), particularly among the miners (98%), know how to tell time. In contrast, a quarter (27%) of women are not familiar with western time calculation ( $\chi^2$  between men and women = 18.94,  $p<0.001$ ). The figure is even higher (34%) among the non-mining women (between mining and non-mining women,  $\chi^2=6.34$ ,  $p<0.05$ ). Mine (89%) are more often literate than women (40%) ( $\chi^2=12.34$ ,  $p<0.001$ ), but both groups compare poorly to national literacy rates of 94% and 85% for men and women (WB 1999). Women also speak on average fewer languages than men

(2:1 versus 1:4,  $t=3.48$ ,  $p=0.003$ ). Few women speak the national language (Dutch) (41%) compared with 71% of men ( $\chi^2=23.18$ ,  $p=0.003$ ).

As compared to non-miners in either sex group, gold miners are advantaged. On average, women have had more formal education ( $p=3.38$ ,  $p=0.001$ ) and are more likely to be literate ( $\chi^2=9.04$ ,  $p=0.003$ ), know how to read more ( $\chi^2=13.92$ ,  $p=0.001$ ), and speak Dutch ( $\chi^2=17.34$ ,  $p=0.001$ ). Formal education, literacy, multilingualism, and the ability to read more are signs of increased acculturation. The data suggest that gold miners and men are, on average, more acculturated than non-miners and women.

#### **Sample Population: Gold Miners**

The sample of gold miners includes people with different professions in the mining area (figure 3-3). I only present the percentage of people in their primary occupations, excluding services that are typically performed as secondary jobs, such as washing clothes. Pit-workers may be under-represented in the sample because I usually found them occupied during the entire day. Shopkeepers and merchants were more frequently able to spare time. I estimate that in reality, Nijaka pit-workers make up just over half of the Nijaka mining population in Sella Creek. For the other occupational groups, the proportional representation displayed in figure 3-3 reflects the population in Sella Creek.

A fifth (20%) of the Nijaka miners reported mining as a business. Because of the high economic insecurity, I could find fewer working as pit-workers to pay for the repair of a broken machine. Cooks and merchants both represented about 10% of the mining population, and those jobs were sometimes combined. Fewer people were owners, delivered transport services, and did all round jobs. Women did many jobs. Yet because

they continued jobs and remained in the mining area for shorter periods than men, the number of Ndipaka women in Kells-cook at a given time was always low.

### **Sample Population: Non-Miners**

Most non-miners in the sample lived in the hinterland, primarily in the villages of Driedadbeige and Mochokai. About 10% lived in Panamuthe. The group of non-miners included twice as many women (34-68) as men (9-17) because women dominate the population in forest communities. Non-miners did various jobs. Women were mostly subsistence farmers (67%). Men produced less frequently for subsistence, only 7% of men practiced subsistence agriculture, and 4% lived from foraging. Other women (10%) and men (17%) informally sold goods and services. More than a quarter of non-mining men (27%) and 3% of women were civil servants, and about half as many men (11%) and women (2-11%) worked in other forms of wage labor, mostly in the city. Fewer non-miners were fishermen (3%) or woodworkers (3%), or lived off pensions (3%) or post-mining incomes (3%). Many women (17%) reported to depend on others, mostly a husband or married kin.

### **Methods**

Here I describe the general research methods that I used to collect and analyze data. In table 3-2 I provide an overview of the main questions I address in each chapter of the dissertation, and of the specific methods that I used to answer these questions. I also summarize what type of data each of the methods generated in relation to the

questions. The questions are ordered according to their appearance in the data chapters four through eight. Below I discuss the methods in more detail.

### **Ethnographic Methods**

I used several ethnographic methods, including life histories, ethnographic interviews, semi-structured interviews, and participant conversation and observation. I conducted practically all interviews in Nijpuka and occasionally, upon request, in Dutch. The life histories of elderly Nijpuka helped me understand the historical context in which the present developments take place. Ethnographic interviews revealed a portrait of the daily lives of Nijpuka women and men today. In 1996, I tape-recorded my in-depth conversations with two women. Because most people were uncomfortable with tape-recording, I recorded all other interviews by hand. All informant names in the dissertation are pseudonyms.

Participant observation and conversation were central to my qualitative understanding of Nijpuka life. In the three villages, I participated in gossip, tales, discussions, and conversations during daily activities: such as grating coconuts, peeling peanuts, and working in the river. Despite my dislike of the manual labor, this place proved an excellent setting where women openly discussed personal and women's issues, marriage and sex. In the evening groups, I let five conversations evolve around plays of chess or informal get-togethers during off-work hours. Like Cleary (1992), I found the gold mining area an excellent research setting from the ethnographic point of view. The mining area offers little entertainment and if nothing else, conversations with and observations of a foreign anthropologist were at least a distraction. I found miners pleased with the interest in their lives and they asked me as many questions about the

Netherlands and the US as I asked them about their lives and ideas. Both in Nijoku village and in the mining area, I was welcomed with curiosity and generosity, and numerous people shared food and shelter.

I also used structured methods to collect and analyze ethnographic data. In chapter five I use ethnographic decision tree modeling to identify cross-jurisdictional for-eater mating or not mating. An advantage of decision tree modeling over non-ethnographic types of decision analysis is that it allows the decision-makers to say what they think is important. Ethnographic modeling can also integrate important pre-diffract-to-research factors such as morality, commitment, and power. Unlike other ethnographic methods, decision tree modeling allows for prediction and extrapolation of the results to a larger population of interest. Another structured qualitative method that I use is a Likert scale to measure individual risk tolerance. Chapter seven contains a discussion of how I constructed and applied the scale. I explain the tests of validity and reliability of the risk tolerance scale in Appendix E.

I used ethnography to develop my hypotheses and place my analysis in a sociocultural and historical context. Throughout the dissertation I use qualitative data to interpret quantitative results, and to provide explanations where statistics are inadequate. In the interest of brevity, I omit ethnographic details that do not help to answer the research questions in a direct way. For more detailed ethnography about the Maroons the reader is referred to Jolly Price's work about gender in Surinamese society (1990), the analysis of Nijoku village by Theodo/Van Pelt and Van Wiering (1981), and studies of social organization and racial change among the Maroons (Delfont and Smeets 1981) and the Comca-Nijoku (Edison 1979). Fieldwork for the above studies was primarily



conducted in the 1970s, but recent ethnographic work on the Maroons is sparse. Polansky and Theodore Van Velsor (1997) collected in-depth interviews with refugees and other Maroon victims from the colonial war. Richard and Sally Price combine data from three decades of fieldwork among especially the Garifuna, to document developments in Maroon arts (1999). My analysis is the only recent in-depth study about the Ndyaka, whose lives have changed dramatically over the past two decades.

### **Quantitative Analysis**

To collect data for quantitative analysis, I composed a survey on socioeconomic characteristics and mining-related information. I adjusted the questionnaire after the first few interviews in the field, and later perfected the wording of the questionnaire with the help of a Ndyaka lay informant in the city. The final survey included the following eight sections:

1. Personal data
2. Household composition, pooling and labor
3. Health
4. Assets, income, expenses
5. Time allocation
6. Mining as a risky activity
7. Mining experiences, and
8. Perspectives on the future

Appendix D contains the entire survey in English. The interview lasted approximately half an hour, which was the maximum time that people were willing to spend answering

structured questions. I typically obtained additional information or clarification in a less formal writing immediately after or before the interview.

I use bivariate and multivariate techniques to test hypotheses. The multivariate models include ordinary least squares, probit, and tobit regressions. I will clarify functional specifications and the meaning and interpretation of the coefficients when I use the specific regressions. I will discuss econometric problems and the way I dealt with them in the respective chapters.

### **Archival Research**

I collected archival data from numerous sources in Suriname, the United States, and the Netherlands, where many historical and current records on Suriname are kept. Studies on macroeconomic historical trends and on social and political histories are based on secondary data from the Suriname Bureau of Statistics in Paramaribo (ABS), the World Bank, and the International Monetary Fund.

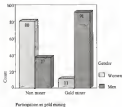


Figure 3-1 Numbers of male and female gold miners and non-miners in the sample population (N=211)

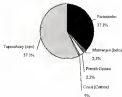


Figure 3-3 Area of residency of the sample participants (N=314)



Figure 3-3 Percentage-representation of different professions performed by gold miners in the study sample (N=102)

Table 3-1. Human capital of Nijika men and women, minors and non-minors

	Sample	Minor ages	Other ages	All men	Minor women	Other women	All women
N	228	81	147	128	11	80	91
Education mean (SD)	4.7 (4.0)	3.9 (3.2)	5.6 (4.9)	5.6 (3.8)	4.6 (3.7)	3.1 (3.8)	3.3 (3.8)
median	3.0	4.0	4.0	4.0	4.0	0	3.0
range	0-17	0-13	0-17	0-17	0-11	0-14	0-14
Literate	38%	50%	68%	69%	38%	68%	48%
Adult liter	62%	48%	32%	31%	100%	68%	72%
Number of languages mean (SD)	2.8 (1.4)	1.5 (1.1)	3.1 (1.6)	3.4 (1.2)	3.1 (0.4)	3.1 (1.2)	2.3 (1.3)
median	3.0	4.0	3.3	3.3	3	3.0	3.0
range	1-7	1-6	1-7	1-7	1-6	1-5	1-6
Speak Dutch	82%	69%	67%	66%	38%	68%	63%

Table 1.1. Main questions, methods, and data generated

Qn.	Questions	Methods	Data Generated
1.	What reasons with known causal (and/or) gold mining in Senegalese towns when it did?	Qualitative Thematic content analysis Archival research	Interpretation understanding of factors changes in people's lives and in Senegalese Test of the relative impact of national and international influences on the Senegalese participation in gold mining Documentation of trends in national and international level indicators over time
2.	What reasons do individual Senegalese consider when they make a decision about gold mining?	Revealed-preference model Ethnography	Model that measures the decision criteria that encourage or discourage Senegalese individuals to become a gold miner Model to predict Senegalese decisions about mining In-depth case explanations of why people become, or do not become, gold miners
3.	What factors does gender compare to the participation of women in mining?	Qual and other observations Predictive regression Ethnography	Identification of the variables that may be barriers to the entry of women into mining Test of the relative importance of the selected indicators of gender inequality in mining Qualitative explanations of the gender bias that remains unexplained in the statistical model
4.	Given the high responses in physical and economic risk, why would anyone choose to be a gold miner?	Labor scale Tobit regression Ethnography Comparative study	Measure and compare risk attitudes of gold miners and non-miners Test of the relative impact of indicators of risk, incomes and of risk and poverty management on participation in gold mining Informal hypotheses Qualitative evidence for or against the hypotheses about quantitative evidence in survey Speculation on general patterns in the conditions that encourage risk taking

## CHAPTER 4

### SCENING OUT INSTANT FACTORS SHAPING THE NÁPULAME-GOLD BELT

Anthropologists have long studied households and communities, but they increasingly recognize that local people are influenced by – and in turn influence – larger scale processes (Auer, Fox and Yellagueti 1996; DeWalt and Poffo 1983; Mearns 1999; Foster and Duffus 1995; Schmitz and Wood 1997; Sporend, Bailey and Woodland 1996). Zooming out from the household to the macro scale reveals how distant forces may indirectly affect local subsistence choices. Here I step back from the Nápalame community to analyze and model the international and national developments that have contributed to the growth of the small-scale gold mining industry in Suriname.

#### Central Questions

In the conclusion to the book entitled *The Shaped Causes of Environmental Destruction in Latin America*, Duffus (1995) discusses how large scale forces affect local resource use decisions. Duffus explains unsustainable land-use as a product of inequality at international and national levels. He argues that in Central America international economic markets create the commercial exploitation of ecologically vulnerable areas. As a result local people have less resources available – and engage in unsustainable commercial land-use practices.



By contrast, Dushane argues that in South America national forces are more important. National inequality lowers the standards of living, and access to resources of privileged groups. These groups respond by using marginal lands (over harvesting and employing other means of unsustainable resource extraction). International and national forces mutually reinforce one another, but in specific cases one may better explain local behaviour than the other. My central questions are:

- Do national or international forces better explain why small-scale gold mining boomed in Suriname when it did?
- What is the relative impact of selected international and national processes on changes in the local mining population?

#### **Approach and Evidence**

Globalisation, urbanisation, and industrialisation are making the world more interconnected and uniform. Communities that were previously relatively isolated are now increasingly exposed to people, commodities, and world events from outside. As a result, the analysis of national and global developments has become crucial to understanding the local realities in which people live and make decisions. Interactions between larger and smaller scales include dynamic socio-cultural, political, ecological, and economic processes, and have temporal dimensions (Adams 1998, Bayart 1993, Balle 1993, 1995, Hirschman 1993, Peluso 1992). For reasons of brevity I focus here only on selected economic and political links at spatial scales.

I take an environmental approach to the study of multi-scale level interactions by coupling qualitative documentation with time series regression analysis. This approach allows me to identify what processes are most important from above, and to

assess the relative impact of selected variables on the Sumatran mining boom. My study contributes to methodology for studying macro-meso-level analyses, and to a better understanding of gold mining in Sumatra. In addition, identifying the large-scale forces that are driving gold mining may inform public policy that mitigates the impact of these distant forces on the lives of local people. Such policy might encourage subsistence practices that are more sustainable than mining.

### Competing Hypotheses

I use the model of Barboza (1999) to test two hypotheses about the relative importance of international and national factors in producing gold mining. Emphasizing the importance of international markets, I hypothesize that

- (I) By determining the profits and production costs of gold mining, international market prices for gold and oil are driving the local participation in gold mining in Sumatra.

Competing with the international markets model is a model that theorizes that political and economic processes within Sumatra encourage small-scale gold mining. I

hypothesize that:

- (II) Economic and political instability at national level are driving the local participation in gold mining in Sumatra.

The competing models do not cover the range of possible explanations and are not mutually exclusive. A third and a fourth option are that a combination of models, or neither one adequately explains the gold rush.

## Econometric Model

I test the hypotheses with an ordinary least squares regression (OLS) to estimate the marginal effect of international and national indicators on the local number of small scale gold miners. The two hypotheses require different explanatory variables:

**Hypothesis 1** predicts that miners respond to international commodity markets. I represent international commodity markets by the international prices of gold and oil, which determine the profits and expenses of a mining operation. I expect that a rising price of gold and a decreasing price of oil encourage small-scale gold mining. I use indicators of national economic and political stability to test the second hypothesis. Consumer prices and unemployment represent economic variability. I use an indicator of the country's openness to international trade to approximate political stability. I predict that consumer prices and unemployment positively relate to the number of small-scale gold miners, and that openness (political stability) negatively associates with mining.

Before I discuss the variables I will document what is known about the size of the small-scale gold mining industry over the past decades. The information will help the reader relate the changes in the variables discussed below to changes in the small-scale gold mining industry. The small-scale gold mining industry seems to have grown since the early 1980s. The last official estimate of annual gold production dates from 1945 and is 30 kg. Today, the annual gold production in Guatemala is estimated to have reached a plateau at approximately 15,000 kg. The present annual gold production exceeds the maximum production during the previous gold rush by more than twelve times.

## Explanatory Variables

Here I operationalize the explanatory variables and qualitatively discuss why I expect specific variables to impact small-scale gold mining. In the next section I will explain the dependent variable that I created to represent the local participation in gold mining. The variables are defined in table 4-1, summary statistics appear in table 4-2, and the raw data are presented in Appendix B.

### Price of Gold

I consider the price of gold for two reasons. First, gold is the international commodity that best suits a test of Deaton's international markets model for the case of Senegal.<sup>1</sup> Second, several researchers have argued that a rise in gold prices encourages informal mining (Cleary 1998, MacMillan 1994, Sponcel 1997). Their argument is based on the observation that small-scale gold mining boomed in Brazil in the early 1970s, when the inflation-adjusted global price of gold rose (figure 4-1). The case of Senegal rests upon the theory that rising gold prices induce gold rushes. Real prices of gold in US dollars and Senegalese guilders declined after 1973, with the exception of a rise in the Senegalese gold price in 1983 following monetary adjustments. In contrast to what would be expected during falling gold prices, the Senegalese mining population grew in the 1970s and 1980s. Because other researchers have emphasized the price of gold, and because of its theoretical importance, the variable remains part of the analysis.<sup>2</sup> I include the price of gold as the log value of the inflation-adjusted price of gold in Senegalese guilders. A lack of historical price data on other relevant commodities prevents me from analyzing the impact of the relative price of gold.

## Price of Fuel

The price of fuel should affect the expenses of gold mine owners, who use gasoline for transport, the operation of mining machines, and generators that deliver power for ventilation and refrigeration. The large variation in fuel use of different mining enterprises, coupled with the sparse written documentation of expenses, prevented the precise calculation of the relative contribution of fuel expenses to the cost structure of mining operations. I used the detailed data from one highly mechanized mining operation in Jalla Creek to estimate the relevance of oil prices for miners. In Table 4-2 (column 2) I estimate that the operation owner spent about 3,768-US\$ each month on fuel, which accounted for 80% of his monthly variable costs. Given an average gold production of 3 kg gold/month, the expenditure of 13,800 US\$, approximately a fifth of the total production value was incurred in fuel. Casual conversations with other mine operators suggest that they spend a similar proportion of their gold production on fuel.

The price of oil fell steadily in the early 1980s (Figure 4-2). Although real world oil prices increased soon after 1985, real oil prices in Surinamese guilder kept going down, to hit a low in 1993. The price of oil increased after that year, but recently fell again due to an increased world production exceeding with weak demand. By lowering production costs, low oil prices may have made gold mining more profitable. The price of oil is included as the log value of the inflation-adjusted price of oil in Surinamese guilders.

## Political Instability

Various researchers have argued that national political instability and inequality hampers the sustainable use of resources by local people (DeWit and Poffe 1993,

Paillard and Dubois eds. 1995, Spensel, Bailey and Bruchman eds. 1996). I documented in chapter two how in Suriname military dictatorship (1980-1987 and 1990-1991) and the interior war (1986-1992) impoverished and socially isolated the Ndyuka. It is likely that these factors, at least, stimulated the participation of Ndyuka in gold mining. I measure the intensity of political instability by the variable openness, following the example of Boix and Doornik (forthcoming). Openness is calculated as the ratio of imports and exports, divided by the Gross Domestic Product (GDP), in formula:

$$\text{Openness} = \frac{\text{Imports} + \text{Exports}}{\text{GDP}}$$

In economic terms, openness measures the ratio of the value of international trade to the value of the national economy. The logic behind the proxy is the political instability index: a country has open by closing off revenues and obstructing international trade.

A graphical representation of how openness to international trade developed over time helps judge the validity of this variable to measure political instability in Suriname (Figure 4-3). Suriname became politically less stable after the military coup of 1980. As expected, openness decreased consistently following the military coup and throughout the period of dictatorship (1980-1992). After the return to democracy (1992), the country becomes rapidly more open due to recovery of trade relations with the Netherlands and the influx of large-scale mining and logging companies. The fluctuations in openness since 1993 are less clear. They may partly reflect the return to power of the political party of ex-dictator Burnama, and the disruption of Suriname trade relations with the Netherlands since then. Because the trend in openness is consistent with political events, I conclude that openness is a good indicator of political stability in Suriname.

## **Inflation and Consumer Prices**

Several researchers have identified a positive relation between inflation and the economy of small scale gold mining (Cleary 1998, MacMillan 1993, Ranganathan 1999). In Suriname, annual inflation rates began to rise during the internal war (1994- 92) and continued to increase thereafter, partly due to a foreign exchange deficit following the collapse of the bauxite industry (Figure 4-4). Meanwhile the legal aspects of consumer goods stopped almost entirely, creating shortages and forcing black markets (Bakker 1999: 18). Shortages coupled with high inflation caused consumer prices to rise (Figure 4-5). Costs of food items increased ten-fold between 1990 and 1997, seriously impacting the quality-of-life. From May 1994 to May 1999 consumer prices increased by 182% (BSP 1999), and in May 1999 alone, the Surinamese guilder depreciated 80% against the US dollar (NBC 1999). I include inflation as the log value of the consumer price index, because this measure has a direct impact on the daily lives of people.

## **Unemployment**

It is likely that people become paid workers when the availability of other jobs decreases. Unemployment rose following the 1967 military coup and peaked at the end of the internal war (Figure 4-6). Unemployment rates had remained under 2% of the economically active population throughout the 1970s, reached over 25% by the late 1980s. The explanatory variable unemployment is included as the percentage unemployed of the economically active population.

## Dependent Variable

The dependent variable is the number of local small-scale gold miners. In absence of national data on the mining population, I used local survey data to create the dependent variable. I asked the Nijpala with mining experience (N=193) when they had first entered gold mining and, if applicable, when they had quit mining. Analysis of the number of people who are added to the mining population annually (growing exits) shows that many Nijpala become gold miners during military regimes (1960-1967 and 1990-1991), the border war (1986-1992), and in aftermath (figures 4-7). Last, that a fifth (19%) of the Nijpala with mining experience had begun gold mining before the military coup of 1982, and almost a third (31%) of mining participants first entered the mining fields during the border war (1986-1992). Reduced accessibility of the border and increasing costs of living after 1992 may explain the large number of Nijpala entering the mining fields immediately following the war (1993). The relatively large proportion of people who entered before 1973 (10%) is due to the large time span this bar represents (30 years) as compared to the other periods (3 years).

The number of new gold miners in a given year may not adequately represent the development in the standing mining population at a given time. The measure ignores that people usually stay for several years. I solve the problem by calculating the cumulative number of miners in a given year, that is, the total number of miners in the previous year plus the number of newly entered miners. Because people leave mining as well, I subtract the number of people who left gold mining in a given year from the cumulative number of miners in that year. Because the macroeconomic data only goes back to the



early 1970s, I limit the analysis to 1970–1998. This means there are systematic problems of bias from memory errors.

A more serious problem is one of attrition: people die or move away over time. I corrected for attrition in the following way. I first estimated what proportion is removed each year from the Nijinka population. This process required data on the age distribution among the Nijinka. However, the population pyramid for the entire Japanese population does not differentiate according to ethnicity (Aldi 1997). Because the age-distribution in the primarily rural Nijinka population is likely different from the age-distribution in the entire population, which is mostly urban, I analyzed the age distribution in my survey sample (N=218). The Nijinka age-distribution is likely to have the pyramidal shape that characterizes poor countries, with large numbers of young people and few people in old age groups. The sample only includes people over 15 years of age.

The age distribution of the sample does not follow the expected population curve exactly (Figure 4-4). A few reasons may explain why I have fewer observations than expected for the youngest age groups. A proportion of the Nijinka in the ages 20–30 may have been killed or left the country during the interior war. People 15–20 years of age were underrepresented in the sample because they typically attend senior schools in the city when they follow secondary education. Furthermore, young men are likely to migrate. After the age of 30, the population distribution follows the expected curve. Except for the youngest age group (15–30), field data seem to reflect the real age distribution in the Nijinka population. I assume that the population pyramid has remained relatively constant over the past 25 years.

The second step in the estimation procedure was to calculate the percentage of people in the sample population who were old enough to be gold miners in any given year (1973-1975). Because gold miners are typically over 15 years of age, I calculated what proportion of the sample was at least 15 years of age in a given year. For example, I calculated how many people were at least 15 in 1975 by counting how many people in the sample were born on or before 1934. Twenty-nine percent of the people in the sample were at least 15 in 1975 and could have been miners in that year. This suggests that 71% of the people who could have been miners in 1975 died or moved away.

The observed number of gold miners in a given year was corrected for attrition by multiplying their numbers by a factor that made up for the missing people. This factor was calculated as a hundred percent, divided by the percentage of the population that was over 15 in a specific year. For 1975, the correction factor is  $100/29$ , which equals 3.4. In that year, there was only one gold miner among all people in the sample who where over 15 and could have been miners (29% of the sample population). To correct for attrition, I multiply the observed number of gold miners in 1975 (1) by 3.4. I then estimated that 3.4 out of 219 people, or 1.5% of the Ndjeka population, were miners in 1975. From the above follows the equation that I use to calculate the dependent variable: the standing number of miners in a given year  $t$ :

$$SMM_t(t) = (SMM_{t-1}) + (100 \cdot N(t) \cdot (100/p(t))$$

in which

$SMM_t(t)$  = Standing number of miners in year  $t$

$SMM_{t-1}(t)$  = Standing number of miners in the year prior to  $t$

$N(t)$  = Number of people who newly entered gold mining in year  $t$

$N(t)$  = Number of people who exited gold mining in year  $t$

$p(t)$  = Percentage of people in the sample who were at least 15 years of age in year  $t$

The data suggest that the mining population has grown steadily since independence (1975), with plainsome growth in the late 1970s, and during the initial years of the miner war (1985-1990) (Figure 4-9). The stagnation in gold mining at the onset of the miner war (1985-1992) can be explained by the inaccessibility of the interior during those years. Yet few miners leave and their numbers rebound again from 1990 onwards. I use the log value of the standing number of miners as the dependent variable.

### Econometric and Data Problems

Several problems characterize the data. First, many statistics for Suriname are inaccurate. For example, during my fieldwork in Suriname, the black market gold price was about 10-20% higher than the official price of gold paid by the Suriname Central Bank. As a result, the inflation-adjusted price of gold in Suriname guilder may not reflect well what gold miners received for their gold in reality. A similar discrepancy between official figures and reality characterizes inflation data, black market exchange rates were up to two times higher than officially reported rates. Because better data for Suriname are not available I calculate the Suriname price rates using international prices, and national exchange rates and inflation indices. Second, crime accounts data may not

measures the phenomenon at hand. For example, national unemployment rates badly represent the Maroons because the data pertain to formal labor in the urban area. Most Maroons live in the forest and perform informal labor, and are not accounted for in national statistics.

An econometric problem is multicollinearity. Some explanatory variables are significantly correlated with one another, including openness and CPI ( $\beta=0.74$ ,  $p<0.001$ ), and the price of gold and the price of oil ( $\beta=0.41$ ,  $p<0.005$ ). Correlations between openness and oil prices ( $\beta=0.39$ ,  $p<0.005$ ) and between unemployment and gold prices ( $\beta=0.34$ ,  $p=0.001$ ) are likely an artifact of chance. It is possible to correct for multicollinearity by dropping one of the variables. However, this procedure would increase autocorrelation and create specification bias, and is therefore undesirable.

I used the Durbin-Watson test to detect autocorrelation and found ambiguous results ( $\beta=0.15$ ). I correct for potential autocorrelation by detrending the time series data. The difference between the models is that the original model captures the general trend over time, while by regressing the residuals, the detrended model analyzes annual fluctuations. Despite the possible presence of autocorrelation, the original model may be more accurate because it is likely that maroons do not respond to annual political or economic changes, but to general trends over time. The small sample size ( $N=22$ ) supports the significance of the results.

## Results

The results appear in table 4.4. I present both the unrestricted (original) model and the detrended model. As expected from error space analysis, the predictive value of the original model is high ( $R^2=0.97$ ) and lower for the detrended model ( $R^2=0.67$ ). Institutional market prices of gold and oil are not significant in either effect size or statistical power, and their effect-direction is opposite to what was predicted. For each percent increase in the price of oil, oil mining becomes more expensive, the mining population is estimated to grow by 0.11 % ( $\beta=1.11$ ,  $p<0.38$ ). A doubling of the price of gold and that in the profitability of mining, is predicted to cause a 13% decrease in the number of miners ( $\beta=-1.04$ ,  $p<0.02$ ). In the detrended model (nonseasonal) market prices have even less statistical power.

Of the national indicators, only the economic indicators are statistically significant. The CPI and unemployment have the expected positive signs and are statistically strong in the original model. Each 1% increase in consumer prices is predicted to cause a 2% growth in the mining population ( $\beta=3.73$ ,  $p<0.005$ ). It is estimated that 1% increase in unemployment will cause a 3% increase in the number of local gold miners ( $\beta=4.42$ ,  $p<0.003$ ). In the detrended model, CPI and unemployment manage to present the right sign, but lose statistical significance at the 5% level ( $\beta=1.66$ ,  $p<0.12$  and  $\beta=1.82$ ,  $p<0.07$ , respectively).

In contrast to what I predicted, openness (political stability) is positively associated with gold mining. The statistical power of the index of openness is weak in both models, especially in the original model ( $\beta=0.18$ ,  $p<0.87$ ). In the detrended model,

per standard deviation increase in the index of openness is estimated to decrease the standing mining population by 0.00044 %, a negligible effect ( $t=1.15$ ,  $p=0.26$ ).

## Discussion

### International Commodity Markets

The estimated overall effect of international market prices is small, statistically weak, and has a direction that is opposite to what was expected; people have become small-scale gold miners in times that gold prices were dropping, and production expenses were rising. These findings contrast logical expectations and existing literature of the gold rush in Brazil (Cherry 1998; MacMillan 1995). The limited explanatory power of gold prices may in part be due to the discrepancy between the official national price of gold and what miners receive for their gold in reality.

The lack of explanatory power of international commodity markets does not imply that forces outside of Suriname have not influenced the gold rush. My observations and conversations with people in the Surinamese mining world, suggest that the migration of *garipianos* to Suriname has stimulated small-scale gold mining in Suriname. *Garipianos* are estimated to make up three-quarters of the mining population and have introduced more modern and effective mining techniques. Because most migration from Brazil is illegal and goes unrecorded, the effect of international migration on the local participation in mining could not be analyzed with quantitative methods.

## Political Instability

Quantitative analysis suggests that political instability in Burmese did not impact small scale gold mining. The informal mining industry grew steadily in times of political violence, but contracted or grew when Myanmar returned to democracy in 1990. The index of openness, which I used as an indicator of political stability, is not significant and has a sign opposite to what I predicted. In short, the statistics suggest that political unrest did not encourage Nijaka to become miners.

The statistical finding contrasts with Nijaka narratives and work by other scholars. Data from these sources indicate that the interior war (political instability) created the present marginal position of the Maroons in Myanmar, which in turn has encouraged mining. In a work entitled *Balaungs, Kachels, and Other Maroons of Eastern Myanmar (1986-1993)* (1990 my translation), Polani and Thoden/VanVelsen analyze stories of Nijaka war victims and human rights reports. They document the killing and torture of hundreds of Maroons, the destruction of Nijaka villages and agricultural plots, the robbery of Nijaka savings, and the destruction of religious shrines by the military. Nearly 10,000 refugees, primarily Nijaka, fled to French Camer (Tinne-Shan 1990). Price (1995) argues that the interior war predated institutional decline for the Maroons as primitives and criminals by city people. It has been suggested that away from the relative prosperity of the Maroons in the 1980s exacerbated the maltreatment of Maroons by Chinthe during the war (Polani and Thoden/VanVelsen 1990, Price 1995).

In interviews Nijaka emphasize that the war played a significant role in decreasing their educational, economic, and social opportunities in society. Many forest schools closed during the conflict, leaving a generation of young Maroons without

education (Hendriksma-Dorenbloeg, pers. com.) Many Nijuka students from Pannamake were spending their summer holidays in the forest when the fighting started, preventing them from returning to school. In the interior, young Nijuka felt they had few options other than mining for gold. After the war, many had reached the age to earn money or had become parents, as the wife of 1 was in the 5th grade of elementary school (in the city), when the fighting started. Then we came to Nijuka territory (the forest). I found a husband, and I got children.' Few youngsters went back to school.

Before the interior war many Nijuka men worked for the government. Eighty-seven of the Nijuka in my survey sample (80/112) listed wage labor experience. Of those 87, 42% had been employed by the government. The percentage compares to the rate found for urban Malawian Marwans in the 1970s (18% Daillet and Korman 1981: 152), and to figures mentioned by Lerner (1961) for Nijuka laborers in the early 1960s. Nijuka men worked for the Geological Mining Service (GDM), the Bureau of Hydraulic Power (BHPW), the Bureau of Public Health's (BCH) anti-malaria campaign, the Sarawak Acheh Company (SLAC), and other jobs that required activities in the interior. They cut forest tracks, took measurements, maintained airstrips, and worked as guides, assistants, and bearers for geological mapping and research. A 63-year-old man tells:

I worked as Sam Creek for the government. I transported goods by canoe and on trails. [He also does Chook support] I also built the Boreogochi dam and assisted the police and doctors. I stayed there for long with my wife 13 years, and had five children there. I also worked for 26 years for the oil and company.

Many older men had experience in diverse public jobs, mostly in the interior.

Government employment was popular because it was prestigious, paid relatively well, and usually continued with informal jobs. Other Nijuka in my sample had worked in unskilled labor such as carrying or clearing (29%), and yet others reported experience in



skilled jobs (e.g., teacher, nurse, 17%), construction (9%), business construction (3%), and informal labor (2%).

The war eliminated public jobs in the forests as well as many jobs in the banana, tobacco, and rubber industries and in construction. However, the data do not show that the war was the main cause of job loss. Many Nijales (38%) reported ending wage labor during the war, but many more (43%) lost or quit formal employment in the years following. Several Nijales mentioned discrimination and being 'labeled unwell' as reasons to quit formal labor. The negative stereotypes about Maroons and their low educational qualifications their competitiveness in the formal labor market. Gold mining is a way to meet daily needs independent of city people.

In summary, the impact of political instability on small-scale gold mining is ambiguous. The interior war (1986-1992) placed the Maroons—especially the Nijales—in a marginal position and destroyed the social, educational, and economic infrastructure in the interior. However, the return to democracy did not encourage people to leave mining. On the contrary, more people have entered the mining fields since 1992. I argue that the long-term economic and social impacts of the interior war are to blame for the growing number of gold miners in recent years. These impacts include poverty, ethnic discrimination, and the poor education of Nijales. A statistical test that compares the periods before 1986 and after supports this argument. There is a structural break in the mining function before and after 1986 (Chow test,  $F=1.804$ ,  $pt\ 0.07$ ), suggesting that the start of the interior war significantly changed the factors driving small-scale gold mining.

## National Economic Instability

The growth of the small-scale gold mining population between 1973 and 1998 seems best explained by national economic instability indicated by the increases in unemployment and consumer prices. Rising unemployment is suggested to cause an increase in the number of gold miners. As I mentioned above, the Mineros may have been especially affected by unemployment. It was impossible to test the impact of Minero-specific unemployment because national employment data are not stratified to regions or ethnicity.

The significant positive relation between consumer prices and the number of miners also supports the hypothesis that national economic instability encourages mining. A rising CPI, an indicator of inflation, forces informal gold mining in several ways. In times of inflation it is beneficial to work in the domain where rising prices for urban housing and services have little impact. Inflation also decreases the purchasing power of formal wages paid in Burmese kyats. In real terms, wages in the mid-1990s were only half of what they were in 1980 (ABS 1997: 39). Wages in construction and government services, jobs in which Mineros are most frequently involved, reached respective lows of 12% and 30% of 1980 wages. As the value of formal wages decreases to below the subsistence minimum, gold mining may offer a more secure way to make a living.

The effect size of the CPI may seem small, each percent increase in consumer prices is estimated to cause a 0.2% growth in the mining population. However, with current Burmese inflation rates of 12% during the first five months of the 1999 (BOP

1899), the mining population could double in just over a year<sup>2</sup>. The fact that the CPI was not statistically significant in the demand regressions does not imply that consumer price changes do not affect gold mining. Rather, it means that the number of miners does not increase simultaneously with annual price changes. This is not surprising because the general trend in prices and wage levels over time is more important for the daily lives of Somalian people than the annual variations.

## Conclusions

At the beginning of this chapter I asked two questions:

- Do national or international factors better explain why small-scale gold mining boomed in Somalia when it did?
- What is the relative impact of selected international and national processes on changes in the local mining population?

To answer the first question, it seems that economic change within Somalia has been more important than international economic markets in encouraging small-scale gold mining. Even though the prices of gold and oil decrease the profitability of mining, international market prices have played a marginal, if any, role in stimulating mining. More important was the economic recession at home. The analysis suggests that along with high and unemployment reemerged among Puntland is becoming gold miners over the past 25 years.

<sup>2</sup> Doubling time (dt) was calculated using the formula  $dt = 0.693 / \Delta$  (growth). Given a 0.7% increase in the number of miners per percent rise in CPI, the number of gold miners would double with a  $100 \times (0.7 / 0.007)$  rise in CPI. Assuming constant price fluctuations, the annual CPI increase of 0.7% is the result.

Empirical analysis suggests that political instability did not affect the participation of Nijaka in small scale gold mining. This finding contrasts with Nijaka women, covered by others, and a statistical test that indicates a structural break before and after the onset of the volatile rate. These sources suggest that the volatile rate made the Maroon a marginal group in Surinamese society. Even though the war ended in 1981 as long-term consequences still have to characterize the lives of Maroons today. I suggest that war-related poverty, coupled with decreasing labor options due to discrimination and poor education, constrains to encourage Nijaka to take up mining.

The small sample size and econometric problems likely account for the limited significance of the results. As a result, I cannot draw strong conclusions about the second question concerning the relative impact of selected indicators. The analysis suggests that international market prices do not influence the number of gold miners, inflation and unemployment significantly encourage mining, and the impact of political instability remains unclear. Based on my analysis, public policy aimed at decreasing the number of gold miners should focus on the regulation of inflation and the stimulation of employment, especially at a local scale. Because the ill-effects are generally lower educated than other Surinamers, it is possible that public investment in forest schools brings a more structural change in the processes that encourage mining.

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suggests a monthly-CPI increase of 10.1%. At such rates, the 100% CPI increase needed to double the buying of domestic medical workers is reached

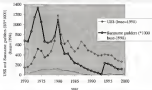


Figure 4-1 Open market average annual US market price of gold/oz. 1970 and 1979 (based 1990)

Source: see Appendix E

Figure 4-1 shows that gold prices have fluctuated greatly over the past decades. US open market rates differ from Burmese in-country rates due to their dependency upon exchange and inflation rates. The low point in the early 1980s is due to an artificially kept low exchange rate, and rose in 1994 when the rate is corrected from 1.8 to 1.34 US\$/US\$.

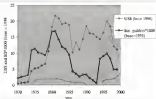


Figure 4-2 World real oil price in US\$ and Sarawak gublen (base=1993)

Source: see Appendix E

Until January 1974, prices reflect the official price of Saudi light, and later the seller acquisition costs of imported crude oil. Real world oil prices decreased during the early 1980s, but increased thereafter (1985). Real oil prices in Sarawak gublen kept going down after 1983, to hit a low of 557 SAR (124-US\$) per barrel in 1993. The reason for this drop was the artificially kept low official exchange rate. From 1985 to 1994, the gublen-to-dollar exchange rate was adjusted from 1 SAR to 134.1 SAR/US\$. As a result, Sarawak prices again lined up with world (1993) rates and Sarawak real oil prices rose sharply.

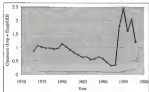


Figure 4-3 Openness (Imports + Exports)/GDP

Source: See Appendix E

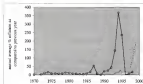


Figure 4-4 Official and experienced annual inflation rates (12 month average)

Source: General Bureau of Statistics, Section Consumer Price Index Numbers (ABS 1997: 38). Data on 1997 from ABS 1999b; data on 1998 from IMF 1999.

All inflation figures are in degree approximations, based upon the all-items index. Official inflation rates after 1994 are largely underestimated due to artificial suppression of the exchange rates by the Burmese Government. The dotted line presents the inflation that was experienced in Myanmar from July 1998-July 1999 (about 300%), and differs strongly from the official rate.



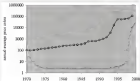


Figure 4-3 Consumer price index, annual average (1970-2000)

Source: see Appendix II

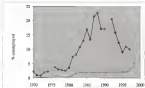
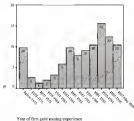


Figure 1-6 Unemployment as a percentage of the economically active population (dark area only)

Source: see Appendix B.

The data used to construct the figure were recovered from different sources that provide different unemployment rates and use different unemployment definitions. Between 1992 and 1993 unemployment rates averaged 17% under the related definition of the Bureau of Economic Analysis (BEA) as compared to 11% under the more conservative estimates that follow the ILO definition (worldwide). Gaps in the figure indicate missing data.



**Figure 4-1** Reported year of first experience with gold mining of Niplica miners and ex-miners (N=154, in percentages)

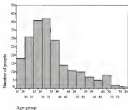


Figure 4-4 Age distribution of the sample populations, number of people in each age group (N=118)

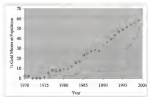


Figure 4-8 Standing Number of Miners corrected for attrition, as a percentage of the total population

Table 4-1: Definitions of the variables in the regression analysis

Variable	Definition
Dependent	
Log (standing number of miners)	Natural log of the standing number of gold miners, corrected for attrition
Explanatory variables	
Log (price of gold)	Natural log of the real price of gold in Serengeti in 1000 guilders, corrected for inflation (1990=100)
Log (price of oil)	Natural log of the real price of oil in Serengeti guilders, corrected for inflation (1990=100)
Control explanatory variables	
Dominance	Natural log of the (Dagosto & Pagoto's) GDP
Log (CPI)	Natural log of the consumer prices for all items
Unemployment	Percentage unemployed of the economically active population

Table 4-2: Summary statistics of the variables in the regression analysis

Variable	N	Mean	Std	Range
Standing number of miners	50	11	42	0 - 128
Price of gold	50	458	136	15 - 1313
Price of oil	50	7108	4423	307 - 16567
Dominance	26	0.89	0.50	0.03 - 2.45
CPI	50	248.1	13769	6.3 - 1061.8
Unemployment	26	9.4	7.0	1.0 - 23.7

Table 4-3 Monthly expenses of a mining operation as a share of the variable expenses (excluding workers' salaries) and as a share of the earnings of the operation

Item	US\$	% from, % of fixed expenses	% from, % of earnings <sup>2</sup>
gasoline (transport)	1 877	40 (140)	49 (132)
gasoline (operations)	11 731	25 655	6 (154)
additional fuel (generators, motor oil)	719	16 (110)	4 (100)
food (e.g. rice, beans, salted meat, coffee)	383	7 361	2 (125)
additional camp and operations needs (e.g. laundry, soap)	33	1 394	0.2 (23.3)
un amortized capital costs for run-up investment <sup>1</sup>	347	7 464	2 (24.2)
un amortized capital costs for electricity <sup>3</sup>	36	1 671	0.2 (24.4)
un amortized capital costs for all terrain vehicle <sup>4</sup>	36	1 699	0.4 (20)
un amortized capital costs for additional equipment (construction, maintenance, fuel flow data) <sup>5</sup>	36	2 (400)	0.1 (23.3)
labor	varying		33 (60.7)
<b>Total</b>	<b>20 648</b>	<b>100</b>	<b>89</b>

<sup>1</sup> Amortized capital costs are the payments for long-term capital investments if the buyer would pay equal shares of the total acquisition cost every month. Amortized capital costs are calculated from the annual depreciation costs and the life span of the item.

<sup>2</sup> The start-up costs for a 6" mining operation are 18 000 US\$. The lifetime of a mining machine is estimated to be five years.

<sup>3</sup> The materials to construct a electricity cost about 50 g (or 450 US\$). Trains use the electricity about 1 year before they need to be for many places or the bus requires replacement.

<sup>4</sup> An all-terrain vehicle costs around 4000 US\$ and has an estimated three-year life time in the mountains.

<sup>5</sup> Many companies may invest in a variety of other items for vehicle or comfort. I estimate that these items cost about 2 000 US\$ and need replacement after about 3 years.

<sup>6</sup> Based upon earnings of 2 kg of gold/month.

Table 4-4 Regression results for the original and the detrended OLS regression models

Explanatory variables	Original Model	Detrended Model
	R <sup>2</sup> 35	R <sup>2</sup> 35
Constant	2.62 *** (4.13)	2.38 E-02* (2.85)
Intercept		
Log (real price of gold in Soudan)	-0.23 (-1.94) 0.09	-1.23 E-04 (-0.02) 0.07
Log (real price of oil in Soudan)	0.12 (1.14) 0.29	0.06 E-06 (0.00) 1.09
Polynomial		
Opt (intercept) (logarithm (logarithm (0.001)))	3.48 E-03 (0.04) 0.02	0.14 E-03 (1.02)
Log (CPI)	0.21 *** (3.22) 0.04	-0.00 (-1.00) 1.2
Unemployment	4.28 E-02 *** (6.87)	0.60 E-03 (1.81) 0.07

Dependent Variable: Log (standing number of miners)

t-values are in parentheses

\* significant at the 0.05 level

\*\* significant at the 0.01 level

\*\*\* significant at the 0.001 level

#### Model Summary

Statistics	Original Model	Detrended Model
N	72	72
R	0.59	0.51
R <sup>2</sup> (Adj. R <sup>2</sup> )	0.37 (0.34)	0.27 (0.23)
Std. Error of Estimate	0.002	0.002
Durbin-Watson	1.81	



## CHAPTER 5 UNRAVELING THE CHOICES OF GOLD MINERS AND NON-MINERS

In the previous chapter I argued that national-level economic instability, and possibly political instability, have encouraged increasing numbers of Ndjuka to become gold miners over the past twenty-five years. Yet the Ndjuka are not a homogeneous group, and not all Ndjuka were equally eager or able to be gold miners when confronted with inflation, unemployment, and civil war. The reasons for getting or not getting into gold mining differ among individuals who vary in gender, age, wealth, health, personal character, or otherwise. While recognizing the heterogeneity in the choices of Ndjuka, it also is likely that general patterns underlie local decisions about gold mining. In this chapter I move in to the local level to investigate these common patterns. I use ethnographic decision tree modelling to identify and structure the main reasons for being or not being a gold miner.

### **Central Questions and Rationale**

My central question is: What options and constraints do Ndjuka themselves consider when they decide to either become a gold miner or to do something else? The answer to this question may reveal why different Ndjuka make different decisions about mining, and helps predict the decisions of Ndjuka who were not part of the sample. The

ideas that appear from the decision tree analysis inform the hypotheses that are tested empirically in subsequent chapters. The results also draw the attention to concerns for missing data, issues hidden by the statistical models that may have measurement or specification errors.

## Methods

I use ethnographic decision tree modeling to analyze how Nijyaka justify decisions about gold mining. Glaser (1989) developed ethnographic decision tree modeling as a structured yet qualitative way to model individual choice processes. A basic assumption is that people simplify complex choice processes by unconsciously making decisions in two stages (Glaser 1989: 45-7). In the first stage, the decision-maker narrows the choices to a feasible selection by eliminating irrelevant or unviable choices. In the second stage, people make a more detailed and conscious decision by ranking alternatives according to relevant criteria (Glaser 1989, Glaser and Marting 1980). The choice processes in the second stage are represented as a decision tree. A decision tree has a hierarchical form that guides the decision-maker from the chosen alternatives (in {} at the top of the tree) to the predicted outcome (go mining/be not go mining), following a set of if-then rules (Glaser 1989).

### Seven Stages in Ethnographic Decision Tree Modeling

Constructing a decision model involved seven steps. First, I collected data by asking different Nijyaka whether they worked in the gold mining area and why (not). From the responses, I extracted the decision criteria that justified the participation in gold mining

or the lack thereof (second step). I used the criteria in the third step to construct models for the decisions of one or a few persons. Next I structured the decision criteria from all Mijaka in the sample by grouping similar criteria under umbrella terms. I used these umbrella criteria to construct a preliminary composite decision model (fifth step).

I tested the preliminary model on a new group of people from the sample population (step six). Based on their responses the test should correctly predict whether they are gold miners or not. The success rate of a decision tree model is calculated by summing the number of false predictions, and dividing the total number of successful predictions by the total number of cases. A model is acceptable when it successfully predicts the choices of at least 70% to 90% of the people (Kishwana 1999). The original model had a high error rate and was adjusted by adding, deleting, and rephrasing criteria, and by reclassifying tree paths (step seven). The corrected model was tested again and proved to work well!

### **Sample**

The initial sample selection construct the preliminary decision model included gold miners ( $N=41$ ) and non-miners ( $N=34$ ) of both sexes ( $N=75$ , 58 men, 21 women). I sampled to capture the variation in the Mijaka population in sex, age, occupation, education, and other social characteristics (table 3-1). Because there were no observations for urban male non-miners, the preliminary model does not well represent the decisions of that specific group. The small sample of female miners ( $N=6$ ) did not affect the model accuracy because the women in the mining area predominantly mentioned the same reasons for mining, and additional interviews did not provide new reasons.

In the testing stage, I guided individual Mijaka who had not been part of the initial sample through the preliminary model. The model was changed based on the

responses of people whose choices were not correctly predicted. When new cases did not require more changes, I tested the second order model on a different sample of Ndjuka. The test sample consisted of 15 men and 5 women of whom 13 people were urban and 7 were non-urban. The test sample compared to the initial sample in age, which averaged 35. Most people from the test group lived in Paramaribo (70%). People from the test sample had, on average, more education (mean = 8 years) and even more urban hours (80%) than people from the initial sample. The test-sample better represented male and female urban non-mothers than the initial sample, increasing the chances that the second order model predicts the choices of both urban and rural Ndjuka with accuracy.

Of the five women in the test-sample, only one was a gold mother. I corrected for the limited variation among the women in the sample by controlling the model with the stories of all women who had ever been in the mining area. These women were part of the sample of Ndjuka who had responded to the larger survey (N=335) that was conducted over the year of fieldwork. Forty women in the survey sample had previous mining experience. Using the detailed-ethnographic notes from interviews with these women, I was able to guide many of them through the model. This procedure was effective in showing the robustness of the female branch of the model. I only used the information of the 40 women with mining experience to first and correct the model, not in the calculation of the prediction error.

## Results in Seven Steps

Now I will illustrate the seven steps of decision tree modeling for my case, and present the results that were generated in each step. In the discussion section I elaborate on the findings and on the lessons that can be drawn from the model.

### Step 1: Collecting Data

My mother died early and I am the eldest child, so I had to take care of my younger brothers and sisters. I first went to Igaza (preferred male) in the French side (French Guiana). At the French side the gendarmes took all the money (Ghana, 38, traveling merchant).

Senia has been working in Suriname gold mining areas since 1990. Before that, like many Nijaka women from the rural Cottica region, she worked as a traveling merchant commuting between Paramaribo and French Guiana. A few years ago, the French started to enforce strict border control to prevent the smuggling of drugs and gold, making it risky for Maroon women to sell their merchandise in French Guiana. Maroon women who had been caught by the French border police, said that the French had confiscated their merchandise, thrown their possessions in the river or taken their money. Now that gold mining has increased in popularity, Nijaka merchants find new markets with willing buyers in the gold mining areas. In doing so, they have become part of the mining economy.

I asked a varied group of Nijaka why they had or had not taken up gold mining. Some people did not give much thought to their choice. 'Nothing, I just went, here you work for yourself' (Jali 36, pt worker and carrier). Others shared more complicated narratives. Foku (27, pt worker) explained that he first came upriver after his parents divorced, and he did not get along with his stepmother at home. His mother, who lived upriver, asked him to

problem. Because a young man cannot stay without work, he went to the gold fields with his nephew. Rakia does not enjoy the work, but he wants to stay upriver for a while because he has trouble with the police in town. "Here you will always find some money to take care of yourself," he said. He wants to return to town when he has saved enough. "I do not want my children to work in gold mining, they should study. Therefore I save [money]."

### Stage 2 and 3: Extracting Criteria and Characterizing Individual Decision Models

Five decision criteria can be extracted from Rakia's account: (1) To escape family problems and the police, Rakia had some upriver as a city person. (2) The main duty is earn money forced him to find employment in the forest. (3) Mining often security: you never return empty-handed. (4) The introduction to the gold fields by a relative enabled him to go. (5) The desire to provide his children with a decent education increased the pressure to generate income. The criteria mentioned by each individual can be organized into a decision model. For a less complex example, consider Alex's (23, pit-worker) answering:

I came back from the Female side. My brother told me "Come, let's go in the gold mining area." I came, and was a year better than the city. In the city you cannot make a. You maybe work for 60,000/00 per month. One bag of rice costs 5,000/00, how are you going to survive? I came perhaps realize these jobs to be able to survive. So you have to work in gold mining.

Alex mentions two main criteria: city jobs do not pay sufficiently, and he has a family member working in the area who introduced him. Figure 5-1 represents his story.

The links between the decision criteria of different people become apparent when other people are added to Alex's model. James (41, non-miner) justifies not working in gold mining by his illness that prevents him from working in the pit. Moreover, he went a few times but was disappointed by his earnings (Figure 5-2). As a final example, two more people are added. Thomas (33, non-miner) is unable to work as a miner because he

is too old. Moreover, the first time he went gold mining, he was not successful. Cecilia (35, non-miner) used to go to the mining area with her husband but she stopped mining. Now she does not have anybody any more to take her to Sella. The model that combines the information for Alex, Juan, Thomas, and Cecilia appears in figure 5-3. As more people are added, it is important to keep the model elegant by excluding reasons that were mentioned but may be irrelevant. For example, because physical weakness due to illness and old age directly lead Juan and Thomas to the prediction 'do not go mining', it is unnecessary to add the other reasons they mentioned.

#### Step 4: Data Structuring Using Protocols

After gathering the responses of a sufficiently varied sample, I evaluated and structured the decision criteria by placing criteria with a similar meaning under specific terms. For example, the label 'work towards a specific goal for a better life' is combined wherever this

- 'You work, you have money, if it grows you do something'
- 'I want to reach a goal, have a good house: money as insurance for the old age. When I find a lot, I'll stop the work immediately'
- 'I will work until I reach a goal'
- 'To reach something, have a house'

I sorted the reduced set of criteria on the basis of how frequently they were mentioned.

The final set of decision criteria presented in table 5-2 shows that economic reasons explain much of why people become gold miners. Many people go mining for reasons of money/poverty (14 people, 31%) and the lack of other work that pays sufficiently to sustain one's family (11 people, 12%). Others mention the desire to buy specific items

(11%), goals that require investment (12%), or the children's future (12%). The most important reason to not work is gold mining or physical disability from illness or old age (12%).

I observed that women mentioned different types of reasons and constraints than men. To research if gender was relevant to decision-making, I separated and compared the choice criteria of women (table 3-3) and men (table 3-4). The sex-specific findings show that the criteria of men and women overlap only partly. Men only consider one out of the top five decision criteria of women. Of the 36 reasons that men mentioned at least three times, only three appear among 'women's ten most frequently mentioned reasons'. I observed two main qualitative differences between women and men. First, men have many reasons to go, while women mention more reasons to not go. Second, economic reasons dominate the considerations of men, while domestic responsibilities and family largely determine the decisions of women.

To reduce the chances that the observed differences were a random effect, I also tested for the influence of age and education. To test for age effects, I divided the sample into young (age = 20-30, N=37) and old people (age = 30-40, N=38). Except for a few age-specific effects, such as the higher frequency of physical incapacity of older people, the reasons mentioned in the different age-groups are similar (tables 3-5 and 3-6). Half (50%) of the criteria from the younger group were mentioned by the older group as well, and vice versa (50%).

Higher ( $\geq 4$  years) and lower ( $\leq 4$  years) educated people (tables 3-7 and 3-8) also share about 50% (2) of the criteria that were mentioned at least twice by the members of either group (15 and 16-criteria, respectively). Only two of the observed differences



relate to education, the higher educated seem more concerned with the education of oneself and one's children (table 5-6, criteria 3 and 3-6). Other differences between the higher and lower educated are not produced by education. Instead the differences are in relation of women and elderly having less formal education than young men. For example, the lower-educated mention physical complaints and the influence of a husband as reasons to not go mining. Physical-complaints and subordination to a husband are probably not produced by one's education, but are related to age and gender. Based on the comparison of criteria I conclude that gender is more important than age or education in differentiating decisions about gold mining.

### **Steps 5, 6, and 7: Building, Testing, and Adjusting a Composite Model**

Because gender shapes Nijjala decisions about gold mining, I used the sex-specific bundles of criteria to construct a composite decision model (not shown). The reasons and constraints were first separated and then matched to make a decision that any reason to work in mining led the decision-maker along the tree, while a constraint stopped him or her from working in mining. An individual did not need to go through all possible reasons or constraints to make their decision.

I tested the preliminary model by guiding a new set of people through the model, using a questionnaire with an if-then structure. I only asked Nijjala who had not been part of the initial sample to respond. After a few questions the interviewers would reach the end of a path. Based upon his or her responses, I would predict that the person would either go or not go mining. I then compared the predicted outcome with the reported or observed behavior. After a few decisions, I adjusted the preliminary decision model to account for the observed errors. A parsimonious model was obtained by combining criteria and deleting

tional phases. For example, one question in the model was reformulated as “Have you had a bad economic experience as gold mining?” This question summarized the experiences of people who had worked in the mining, got lost but had not found gold, people who had extended financially in a mining operation that went bankrupt, and people who had worked as merchants but had failed to collect outstanding credit accounts.

I tested the second order model (Figure 3-4) with a new group of Nqaja. Only one out of the 20 Nqaja in the test did not reach the predicted outcome, which means that 95% of the decision outcomes were predicted correctly. Because the test sample was small, it is desirable to re-test the model with a larger sample in the future.

### **Decisions: Gender and Risk in Gold Mining**

The decision tree (Figure 3-4) models decision-making about gold mining, and predicts the decisions of Nqaja who were not interviewed. The decision model splits into a male and a female branch with different criteria and a different structure. For women, there are only two reasons to consider entering mining: the economic responsibility over an urban household, and the desire to stay with a mining husband. Yet many constraints keep women from mining, including transport and domestic limitations, and the risk to one's reputation and health. Men become miners for multiple economic reasons and are only held back by the economic and health risks of mining. These risks often had been experienced during previous participation in mining. Below I draw conclusions from the model, focusing on gender and risk.

## Gender

In Ndjuka forest communities, labor and space are organized along gender lines. Ndjuka men provide the household with cash and non-product consumer goods. Many mine-site miners to meet their financial responsibilities towards their wives and children. Frequent travel outside the forest further increases the financial needs and desires of men. Several men wanted to buy specific items such as a boat, a house in the city, or new clothes. Others saved their money to buy a shop or taxi, or to travel to the Netherlands. Even though miners love the independence that mining offers, gold mining is primarily a negative choice, other jobs do not pay enough or else require more education. Gold mining is a last resort, explains Albert (23, job-seeker):

[In the city] with 60 000 till you'll have to pay for school, a car to drive to work, money for electricity. The money [in gold mining] suffices for nothing. I am able to struggle for one year, two years. Then you can work in town, more relaxed. But if you start working a city job then you'll work harder to have a good life, you need to eat as well.

Like many Ndjuka miners, Albert perceives gold mining as a short-term sacrifice for a better future for himself and his children. Eighty-six percent of miners did not want their children to be gold miners, compared with 6% of miners who would welcome their children in mining. Five percent of miners felt that their children should decide for themselves, and the children of the remaining 3% already were gold miners. Most miners wanted their children to become educated for doing less strenuous sitting work. Some miners specifically mentioned work 'in an office' or 'with a computer'. One gold miner explained that 'if you come [in the mining area] you give out on a lot. In the city you find newspapers, development. In terms of personal development, you can only go backwards here.

A few women became miners for the same reasons that men do: to earn the household income. Munghe (M, traveling merchant) is a female miner. Munghe used to *gongol*, to sell goods and services informally, elsewhere. Her then husband introduced her to the mining area. Today she and her husband are separated, and Munghe involves with male relatives who bring supplies to the camps. Eight out of the eleven mining women in the larger survey sample were single mothers and the household breadwinners (75%). They needed the mining income to provide for their children or younger siblings, and to give their children a better future.

Most women, however, find gold mining incompatible with their household and child-care responsibilities. A young woman (M) explains:

I went to Sella once, about a year ago. I sold *[mugika] [cassava product]* in Chicago [name of one of the mining camps in Sella Creek]. Now I have a baby I do not go anymore. I will return when the baby no longer needs breast-feeding.

Households often impact the decisions of women about gold mining. Almost half of the women (47%) mention the influence of a spouse. Many men forbid their wives to go, as one woman (M) says: 'I have been wanting to go to Sella. My younger sister has asked me to come, but my husband does not want it. He does not want me to leave him.' Women may also follow their husbands to assist or watch the work. Olga (O) used to go to the Sella Creek mining area to cook for her husband. Now that he has another wife he no longer takes her, and consequently she stays home.

Household and male kin are crucial for the introductions and transport to the mining area. Out of 48 women with mining experience, more than half (50%) had been introduced to gold mining by a partner and 33% by a brother. With men dominating mineral cover transport, 28% of Males' women perceived mobility as a barrier to travel

to the mining area. One woman (J1) explained that she did not work in the mining area because 'I have nobody there. I have not found the opportunity to go. You need to have family [for the mining area].'

In contrast, men did not mention their partners' input on the decision to be or not to be a gold miner. It is unclear whether female partners have no influence, or whether men do not acknowledge the influence of their wives in interviews. Many women agreed that 'if you do not have someone to be a gold miner, you will not have money'. It is likely that women who recognize the financial benefits of gold mining, encourage their husbands or sons to go mining. Even so, field observations and conversations with men and women suggest that the ultimate power of decision-making is in hands of the men.

## Risk

Considerations of risk play an important role in decisions about mining. Health concerns and economic uncertainty are the only reasons for men not to go mining. Jena (H2, ex-man) learned from his prior engagement in mining:

I went with a gold, but failed to make it. The equipment wasn't good, so I did not want to continue. Perhaps you are lucky and you find something. Or perhaps you go, you are not lucky, and you do not find anything. With other work you are sure that your children will have something.

In the preliminary decision model, I assumed that male miners neglected health risks because of the economic prospects of mining. Yet when I tested the preliminary model by asking miners of expected profits considered health concerns, they strongly denied that this was the case. Gold miners explained that they were actually acutely aware of the health risks of mining. However, they believed that they were able to mitigate health risks by working only in the mining area for limited periods at a time, mining only for a few years before retiring, using protective masks, and not smoking in the pit. For example, Ben

(11, pit worker) avoid health problems by returning to camp after a few months of work, to let his body rest and build up strength. “You know from our struggle, your health is always more important. That is why we should not stay for six months.”

Many Nāpaka men perceive mining as a short-term end that will enable them to move to a better future. Aduia (39, machine operator) explains that gold mining is a risky job: you cannot do it your whole life long. For a short period of time you can do it, to set up another job. Nāpaka men also protect themselves against accidents and illness by using sting, traditional magic. Men cover their bodies with pinea extracts or drink tea from selected branches or leaves to protect themselves from harm.

Other male miners reduce health risks by not working in the pit where most accidents occur. Jiro (32) uses diverse methods to one of the camps. He chooses the place from woods, he cuts canoe-paddles for sale, and sometimes he returns home. That way, he says, he does not overly strain his body. Moreover, the chance of contracting malaria is lower for people who have grown up in a malaria-prone environment and who have developed a natural resistance. Jiro for example has never experienced malaria.

The other men (97%) mine because they find it provides more security than wage labor in town, explains Ewen (25, pit worker):

[I mine for gold] for the money. I myself I do not want to do the work, I don't like it. I already did other jobs, but in gold mining you do not lose your money. When you come, you only need to take your clothes with you. The boat has all tools.

With today's increased prices for food and housing, an uncertain yet so-rewards home mining income may provide more security than a diminished salary in the city. In the mining camps, Ewen does not pay for food or housing, and can save all the money he

mine. Although mining earnings are variable, he knows that you will always find something.”

Women enter less often to economic and health risks than men, in part because they face so many other obstacles to entry into gold mining. Moreover, many women in the mining area are traveling merchants, who may be exposed to fewer economic and health risks than, for example, pit workers. The female merchants I met stayed chiefly in the mining area and often refused to sell on credit.

While it is the norm that men are miners, women who travel to the mining area face serious social risks. Many people believe that women who work in the mining area independent of a husband participate in sex work. As a result, these women may severely damage their reputation in the tightly connected Ndjuka communities. In addition, women in the mining area are subject to sexual harassment and jokes, which add emotional stress to the already hard conditions in the mining camps.

## The Dealer

To better understand the limitations and strengths of the model, it is useful to examine why some people do not correctly follow the cost diagram. The dealer in the presented model (figure 3-4) is a Ndjuka woman, who I will call Grace (42, machine owner), a single mother of seven children. Grace supports her children with her gold mining business. She used to work as a schoolteacher but with that money you cannot support your family.<sup>1</sup> After her divorce, Grace returned from French Guiana to Sarawak where she heard much about the mining business. She decided to give it a try. She bought a machine and traveled to Sella Creek with her brother, who was already working there.

The experience has not been good. Gracia had never lived in the mines, and she does not feel at home because she does not know most people. Moreover, the disappointing earnings do not compensate the frequent bouts of malaria and other hardships. Based upon her story, the tree model predicts that Gracia does not go mining, yet she does. This erroneous prediction may soon become truth. Gracia wants to sell her mining equipment and return to Panamela as soon as possible.

### Conclusion

The decision model predicts with accuracy 85% of the decisions of individual Nijales about gold mining. The model shows that Nijales who choose between gold mining and other subsistence strategies weigh economic concerns and risks against one another. Gender affects the choice: men and women have distinct economic responsibilities, and thus different risks when they go mining. Men have many reasons to become gold miners. They are expected to financially sustain their households and find that their limited education eliminates other job options, which in any event, pay less than they need. Mining offers a possibility to work on the forest free from city taxes and the expense of city life. Other ways to make a living are only considered to avoid other previously experienced health or economic risks related to gold mining.

Women only travel to the mining area when they either are the economic providers for their families, or want to join mining husbands. The freedom of choice of women is limited by ethnological and material constraints; women have less access to transport, are responsible for domestic work and child-care, and confront objections of



husbands. A woman who suggests her appropriate gender role risks losing the respect of her husband and the community. Becoming a social outcast is her mode of a risk for women or for forced contributions, who depend upon the economic contributions of a husband and maternal relations with community members for their well being.



Figure 3-1 Decision model for men going



Figure 5-2: Decision model for one person



Figure 5-3: Decision model for four people



Table 3-1 Summary statistics for the sample population

	Sample	Men			Women		
		All	Married	Others	All	Married	Others
N	53	26	20	13	27	6	18
Age (years)	33.3	34.4	30.6	44.5	31.8	28.3	33.3
Mean (range)	(18-59)	(18-59)	(18-48)	(23-70)	(18-58)	(19-38)	(18-58)
Education (years)	4.4	5.3	6.1	3.6	2.8	5.3	1.8
Mean (range)	(0-12)	(0-12)	(0-12)	(0-9)	(0-8)	(0-8)	(0-7)
Urban <sup>a</sup>	46	33	28	7	7	3	3
M (%)	(87%)	(65%)	(71%)	(54%)	(26%)	(50%)	(22%)
Rural <sup>a</sup>	24	13	12	6	8	3	4
M (%)	(45%)	(34%)	(37%)	(46%)	(30%)	(50%)	(22%)

<sup>a</sup> Urban refers to residency in the capital, Paramaribo, versus residency in any of the towns or in the rural villages.

Table 3-2 Frequency index of decision criteria mentioned by Nijirika gold miners and non-miners (N=33, listing only criteria mentioned more than once)

Criteria	Freq.	%
1 Money/poverty	16	20
2 Freedom/independence (from city/home)	12	16
3 Other work does not pay sufficiently to sustain a family	10	13
4 <sup>a</sup> Physically unable to go/old age, illness	9	12
5 Work towards a specific goal/for a better life	9	12
6 Children's future	9	12
7 To try what I want (city/work/other)	8	11
8 Bad experience in the city or with city police	7	9
9 <sup>a</sup> I have nobody to take care there: lack of transport	7	9
10 There is no other work	7	9
11 I found a mining job in Kells that does not require working in the pit	6	8
12 <sup>a</sup> Husband does not take care there anymore (has another wife, is too old, no longer gets)	5	7
13 <sup>a</sup> I want a few dollars, but I did not find money working in the hole	4	6
14 <sup>a</sup> I used to take care of the household/children/baby	4	5
15 To stay with husband/partner who is a gold miner	4	5
16 Gold mining earns more than in other jobs	4	5
17 Security	3	4
18 <sup>a</sup> Work is too heavy/ damages your health	3	4
19 Experience was: members, mining areas are a good market	3	4
20 <sup>a</sup> The trip is too long	3	4
21 No papers/qualifications for a better job	3	4
22 Looking for new opportunities/ a challenge	3	4
23 I just go with the flow (how the wind blows)	2	3
24 My father took me as a young child	2	3
25 I have no husband to support around my children	2	3
26 <sup>a</sup> I run money doing other things	2	3
27 The devil was made me come upriver	2	3
28 I am from here, so it is easier to make money here	2	3
29 <sup>a</sup> Other people will say things in Kells for me	2	3

<sup>a</sup> Because no non-participants in gold mining

Table 3-2 Frequency rating of decision criteria mentioned by Naljala women (24-33)

Criteria	Freq	%
1 <sup>a</sup> I have nobody to take care there, back at home	7	29
2 <sup>a</sup> My husband does not take me there anymore (has another wife, is too old, no longer good)	5	20
3 Identity/paternity	5	20
4 <sup>a</sup> I need to take care of the household/children/body	4	16
5 To stay with husband/partner who is a gold miner	4	16
6 <sup>a</sup> The trip is too long	3	12
7 Experience as a merchant, making sense in a good market	3	12
8 <sup>a</sup> Other people will pay things on behalf for me	2	8
9 I have no husband to support me and my children	2	8
10 Children's future	2	8
11 <sup>a</sup> Husband does not allow me to go	1	4
12 <sup>a</sup> Physically unable to go (old age, illness)	1	4
13 <sup>a</sup> Afraid of malaria	1	4
14 <sup>a</sup> I do not have anybody there, you need family there	1	4
15 <sup>a</sup> Women do not work in gold mining	1	4
16 I have to (eventually) save for my younger siblings	1	4
17 Work towards a specific goal/ a better life	1	4
18 Gold mining earns more than in other jobs	1	4
19 Other work does not pay sufficiently to sustain a family	1	4
20 To buy what I want/specific items (shop/buy clothes)	1	4

<sup>a</sup> Reasons to not participate in gold mining

Table 5-4 Frequency rates of decision criteria mentioned by Nijijika men (N=60)

Criteria	Freq.	%
1 Freedom/independence	12	20
2 Money/poverty	11	20
3 Other work does not pay sufficiently to sustain a family	9	15
4 <sup>a</sup> Physically unable to go (sick up, illness)	8	13
5 Work towards a specific goal like a better life	8	13
6 To buy what I want/specific items (clothes/food/etc)	7	12
7 There is no other work	7	12
8 Bad experience in the city or city-jobs	7	12
9 Children's future	6	10
10 I found a job in Sella that does not require working in the pit	5	8
11 <sup>a</sup> I went a few times, but I did not find money working in the pit	4	7
12 I have up papers/insurance/paid business for a better job	3	5
13 Gold mining earns more than other jobs	3	5
14 <sup>a</sup> Work is too heavy/ damages your health	3	5
15 Sexually	3	5
16 Looking for new opportunities/ a challenge	3	5
17 <sup>a</sup> I earn money doing other things	2	4
18 The civil war made me some enemies and need a job here	2	4
19 I just go with the flow (how the wind blows)	2	4
20 I am from here, so it is easier to make money here	2	4
21 My father took me as a young child	2	4
22 <sup>a</sup> My brother died in Sella after an accident	1	2
23 <sup>a</sup> The shop where I worked in Sella closed	1	2
24 <sup>a</sup> Government job offers second currency	1	2
25 <sup>a</sup> The place is weird (mist, evil)	1	2
26 <sup>a</sup> I used to work in border-thermore	1	2
27 <sup>a</sup> I went a few times to sell but people never paid me, so I did not earn my money	1	2

<sup>a</sup> Reasons to not participate in gold mining

Table 3-5: Frequency ratios of decision criteria mentioned by Ndjoko gold miners and non-miners at ages 36 and younger (34-37, listing only criteria mentioned at least twice)

Criteria	Freq.	%
1 Money/poverty	13	33
2 Other work does not pay sufficiently to sustain a family	8	16
3 Freedom/independence	5	12
4 Children's future	4	11
5 There is no other work	4	11
6 Work towards a specific goal/ a better life	4	11
7 <sup>a</sup> I need to take care of the household/children/hub	4	11
8 To buy what I want/specific items (shop/household)	4	11
9 Security	3	8
10 Gold mining seems more than other jobs	3	8
11 To stay with husband/partner who is a gold miner	3	8
12 I found a job in Sella that does not require working in the pit	3	8
13 I have no papers/training/qualifications for a better job	3	8
14 <sup>a</sup> I have no money to move off things	3	8
15 <sup>a</sup> I have nobody to take me there	3	8
16 I just go with the flow (don't plan ahead)	3	8
17 Bad experience in the city or city jobs	3	8

<sup>a</sup> Reasons to not participate in gold mining.

Table 3-6: Frequency ratios of decision criteria mentioned by Ndjoko gold miners and non-miners older than 36 (34-38, listing only criteria mentioned at least twice)

Criteria	Freq.	%
1 <sup>a</sup> Physically unable to go (old age, illness)	9	34
2 Freedom/independence	7	29
3 To buy what I want/specific items (shop/household)	5	14
4 Bad experience in the city or city jobs	5	14
5 Work towards a specific goal/ a better life	5	14
6 <sup>a</sup> I have nobody to take me there/ lack of transport	5	12
7 <sup>a</sup> My husband does not take me there anymore	4	11
8 Children's future	4	11
9 Other work does not pay sufficiently to sustain a family	4	11
10 <sup>a</sup> I need a few things but I did not find money working in the pit	4	11
11 I found a job in Sella that does not require working in the pit	3	8
12 Money/poverty	3	8
13 <sup>a</sup> Work is too heavy/ damages your health	3	8
14 <sup>a</sup> I miss money doing other things	3	8

<sup>a</sup> Reasons to not participate in gold mining.



Table 3-7 Frequency ratios of decision criteria mentioned by Nigerian gold miners and non-miners with four or less years of education (N=40, listing only criteria mentioned at least twice)

Criteria	Freq.	%
1 Money/poverty	8	21
2 <sup>a</sup> I have nobody to take care of me/lack of transport	6	15
3 <sup>a</sup> Physically unable to go (old age, illness)	6	15
4 Other work does not pay sufficiently to sustain a family	5	13
5 <sup>a</sup> My husband does not take care of me/significant (has another wife, is too old, no longer goes)	5	13
6 To stay with husband/partner who is a gold miner	4	10
7 <sup>a</sup> I have no money to cover toll/donations	3	8
8 <sup>a</sup> I want to take care of the household/relations/family	3	8
9 <sup>a</sup> Work is too heavy/damages your health	3	8
10 To buy what I want/specific items (shop/buy/clothes)	3	8
11 Freedom/independence	3	8
12 <sup>a</sup> Other people sell my things in Beke for me	3	8
13 I have no husband to support me and my children	3	8
14 <sup>a</sup> I am money doing other things	2	5
15 Children's future	2	5
16 <sup>a</sup> I went a few times, but I did not find gold	2	5

<sup>a</sup> Reason to not participate in gold mining

Table 3-8 Frequency ratios of decision criteria mentioned by Nigerian gold miners and non-miners with more than four years of education (N=15, listing only criteria mentioned at least twice)

Criteria	Freq.	%
1 Freedom/independence	9	36
2 Work towards a specific goal/a better life	6	20
3 Real experience in the city or city-jobs	7	30
4 Money/poverty	7	30
5 Children's future	6	17
6 Other work does not pay sufficiently to sustain a family	5	14
7 I found a job in Beke that does not require working in the pit	5	14
8 To buy what I want/specific items (shop/buy/clothes)	5	14
9 There is no other work	4	11
10 Gold mining seems more than other jobs	4	11
11 <sup>a</sup> Physically unable to go (old age, illness)	3	9
12 Security	3	9
13 <sup>a</sup> I went a few times, but I did not find gold	2	6
14 I have no papers/training/qualifications for a better job	2	6
15 Looking for new opportunities/a challenge	2	6

<sup>a</sup> Reason to not participate in gold mining

## CHAPTER 6 HOW GENDER LIMITS THE PARTICIPATION OF WOMEN IN GOLD MINING

In the previous chapter I explored how individual Nijukia decide whether to become gold miners or not. I concluded that men and women make decisions about mining differently because they face different options, responsibilities, and constraints in their daily lives. One observed difference was that men mentioned many reasons to become gold miners, while women mentioned many reasons to not do so. Here I explore in more detail what keeps women from entering mining as workers equal to men. I will empirically test explanations that appeared in the decision model, as well as possible barriers to entering mining that I observed in the field.

It is curious that few Nijukia women participate in mining for two reasons. First, small scale gold usually attracts poor people with limited access to the formal labor market. Nijukia women are among the poorest and the least privileged people in Suriname, and their on average low education and literacy rates obstruct formal employment. Given their precarious economic position and limited options to earn cash money, why do Nijukia women forgo the opportunity to earn a mining income?

Second, women make up a substantial proportion of gold miners in Africa. The United Nations (1994) has estimated that 75% of artisan miners in Ghana are women and that women represent 50% of the miners in Madagascar, India, and Zimbabwe. Shaller (1995) reports that in the Republic of Guinea, gold mining is the principal economic

activity of women, while men are mainly agriculturalists. In contrast, I estimated from observation that for every Nijaka woman in the mining area there were about 15–25 Nijaka men. The average man in the sample had spent more than 8–9 years in mining over his life time; the average woman had mined for less than a year total ( $M=209$ ,  $p=0.0$ ,  $p<0.001$ ). Given that women in several African countries participate in mining as much as men, what prevents Nijaka women from doing so? This question is especially intriguing when one realizes that the Nijaka originate from Ghana, Togo, Côte d'Ivoire, and Nigeria, and share many cultural traits with people in these regions.

### Central Question

Why are so few Nijaka women gold miners? It is important to identify the barriers that exclude Nijaka women from small-scale gold mining because participation in mining typically allows women to gain greater wealth, economic security, and authority in making decisions (Lubiano 1996). Policy aimed at improving the economic well-being of Nijaka women and their children could address these barriers and carry out interventions.

Studying women in mining is also relevant because women are generally overlooked in mining studies (but see Rodriguez 1994). Some researchers do not mention the sex of miners (Bowers, Verbeuren and Odi 1996) but implicitly refer to miners as men (Clancy 1990, Mitchell 1993, Houghton 1993, Smeat 1993). At best the presence of women in mining is noted without revealing details about their experiences (Hosley 1996, Odi 1996). I observed that women in the gold mining areas of Tanzania

had different reasons to become miners than men, partly because women did different mining jobs and faced different mining risks as compared to male miners. Therefore, generalizations about gold miners that are based on interviews with men may not apply to women. I hope to clarify the decisions of women about mining.

### Approach

I use quantitative and qualitative methods to determine what factors influence the probability of a woman to enter mining. My quantitative model is informed by factors that were mentioned by Maricao women, and by my interpretation of field observations. Based on findings from the tree model (chapter 5) I will test for the influences of mobility (transport) and children responsibilities. Mobility is important because women continuously travel between the city-down villages and the mining camps. Women also mentioned that their domestic duties, especially children, were incompatible with mining. Taking children to the mining area is undesirable because it is a disease-prone environment and far from schools.

In addition to men's reasons (those mentioned by Nijuka women) I will test some of my own ideas from fieldwork. I noted that people who want to become miners need money to pay for travel and buy work supplies such as tools and a flashlight. Women typically have no or little cash money, which likely limits their ability to buy supplies and to travel. I also observed that miners are usually more accustomed than non-miners. I use the term *venturosismo* to refer to one's ability to integrate in life outside the local communities. In the next section, I will discuss gender in Nijuka society and explain why men have more contact with the world outside Nijuka territory than women. The

ability to operate in the outside world is important for gold miners who continuously travel to and trade in Freetown.

I will use qualitative methods to control the quantitative findings and to analyse factors that interact unexploited in the quantitative model. For example, some women said they were not mining because they feared the disapproval of their husbands. I control the effect of spousal domination with qualitative methods because I do not have data to measure the individual variation this variable. I will use ethnography to explore how ideological factors that could not be measured quantitatively interact with material variables to shape the options of women to enter mining.

### **Hypothesis**

I propose that the Njala gender system restricts the participation of women in mining by two means: (1) Women have less access to resources (e.g. mobility, money, accumulation) that are critical to being a miner, and (2) Women are more frequently involved in domestic tasks that are incompatible with gold mining. I hypothesise that

Gender inequality restricts the entry of women into small-scale gold mining by limiting the access of women to money, mobility, and accumulation, and by assigning women the responsibility over children.

It follows from this hypothesis that a quantitative model that controls for the indicators of gender inequality (e.g. money, mobility, accumulation, and children) should find that women are as likely as men to be miners. Before turning to the methods, results, and discussion sections I discuss gender in Njala society. The qualitative description below informed the hypothesis and frames the discussion of gender here in the chapter.

### Gender in Nijjala Society

In Nijjala households and communities, men and women operate largely independently from one another (Dellert and Simeon 1981, Price 1983, 1985, Tiedje/VanVliet and VanWiering 1990). Men provide game, money, and crop products. Their responsibility for the household cash income typically requires men to leave the forest communities for prolonged periods of time. Women are almost solely responsible for their offspring, domestic tasks, and growing food for the family. Because men are frequently absent from the house, women make most decisions about the management of the household and agriculture.

Nijjala women in the interior usually control agricultural land, a house in a forest village, and a canoe (table 6-6). Among forest women only, 14% owned land, a similar percentage owned a house in a forest village, and almost half (48%) owned a canoe. More Nijjala women (64%) than men (30%) in the sample owned land ( $\chi^2=29.13$ ,  $p<0.001$ ). Also more women than men owned a house in the interior and a non-maintained canoe, but these differences were not significant ( $\chi^2=0.35$ ,  $p=0.55$ ,  $\chi^2=0.60$ ,  $p=0.43$ , respectively). Formally, no restrictions keep women from acquiring land and other possessions.

#### Husbands and Wives

The apparent autonomy of Nijjala women is deceptive. Gender inequality in African society limits the access of women to political positions, money, and contacts with the outside world (Price 1984, 1985). Male labor provides the basis of the lives of women in the interior. Men clear the forest for subsistence plots, build houses and

goldfish, and even motor boats and cars. A man also supplies his wife or wives with essential city goods such as oil, salted fish and pork, rice, low-low socks, talcum, and other household supplies, or the money to buy these items in the city (Poon 1995). Ross (20) explains that to be single is synonymous with poverty:

If you do not have a husband then you yourself will have to figure out what to do. And if you have to clear [land] yourself it will never be a large plot, it will be a small plot, nothing more, because you cannot clear the forest like a man. Or maybe you have family that helps you clear. But for the largest share, if you do not have a husband, you will have to do it yourself with your tools. That is heavy! If you do not have a husband and you do not run yourself, then you will have no place to plant. Maybe a family member who has just returned [from her field] will give you a little bit, or a man has a bit for you to take.

In the above narrative Ross indicates that single women typically only clear a small subsistence plot. Other unmarried women reuse old plots, but such land has a lower output. As a result single women are usually unable to produce sufficient food for themselves and their children, let alone surplus to sell for money.

Unmarried or widowed women depend on male-related kin relations, but they often feel that begging a male kinsman for help is shameful. Begging is also ineffective because men tend to deliver services of low quality to their sister or mother than they would to their own wife, such as food that is left over from their own household.

Moreover, explains Ross as she contrasts reliance on kin does not provide security:

Some people [family members] they help you clear forest for a plot, because it is only once a year that the forest is cleared. So maybe they will help once, but perhaps will not help every year, two years, three years.

Unmarried women are also less mobile. Most Nijoka villages are situated on islands in the coast, and women can often only reach their agricultural fields by water. A boat is an important wedding gift that a man presents to a new wife. Women without a boat must borrow a boat, which creates obligations to return labor or produce. Ross continues

If you do not have a husband, you will not have a home. If you go somewhere, you borrow the home from someone: you rent. Then you go. If you come back, then you announce that you have come, and she will take her home back.

Now, a single woman (40), confirms that being single means depending on others:

My husband left and went to live with another woman. He just left me with the children, ten, eight, and fourteen years old. Now my husband has another wife in the city, he no longer supports me. Sometimes someone gives me a piece of a kaling that I can give the children. My children wear shabby pants, shabby dresses.

A husband can provide economic and material security, but husbands are scarce.

Even though many men have two or three wives, there are more women without

husbands than men without wives (Pruitt 1988, *pers. obs.*). The surplus of women is

partly explained by the younger age of marriage for women and the larger number of men

who migrate temporarily or permanently. Due to their dependence on men and the lack

of available husbands, women have little power to protest polygyny or other disabled

male behavior. In theory a man who wants to marry an additional wife needs the

agreement of the earlier wife or wives. In practice that does not happen, says Jhansi:

(20)

If the man wants to take another wife then he will have to ask you first. But if you do not agree he will do it anyway. The only thing you can do is leave, but how will you support yourself? It is a better if a man takes another wife than a *leading cause* (woman), because a *leading cause* is free to leave and take another man if she wants to. Therefore a lot of love and money are spent on her. As for your wife, you do not have to put so much money in pleasing her anymore.

Warning the listeners of many Nigala women with whom I talked, Jhansi notes that a

divorce is usually not an option for a woman who is dissatisfied with her husband's

involvement in new relations. Even though the Nigala community typically accepts a

woman's decision to leave her husband, especially when they believe that she was not

satisfied with a lack of economic self-sufficiency functions this option for most women



During the time of fieldwork, I only experienced one case of a woman leaving her husband in a forest village. The woman concerned originated from the city, spoke Dutch, and had wage labor experience, increasing her ability to support herself.

Fatherhood also explains how men take advantage of the dependency of women by involving in commercial affairs. Men try harder to please a *housholdwife*, the wife, because that woman will take another man if she does not receive the support and attention she desires. Misunderstanding the favorable treatment, being a mistress compares negatively to being a wife, which provides more economic security. It is not uncommon that a *housholdwife* ends up with a child from the man, increasing her present economic position. To be an unofficial partner is also disadvantageous because the community usually does not respect you. It is not uncommon, I observed, that a woman would or physically molest the *housholdwife* of her husband with the approval of community members.

### **Unequal Education and Income**

Women have less access to human and capital resources than men (table 6-1).

The similarity in the average ages of men (34) and women (35) in the sample makes it unlikely that disparities are produced by age effects. I provide both the mean and the median of school variables to minimize distortal data interpretation due to the large variance within some-sex groups. On average men have more education than women. A majority of men complete the six years of elementary school (57%) versus only 39% of women ( $\chi^2=17.59$ ,  $p<0.001$ ). More than half of the women drop out before or in the third grade. Most men (58%) but less than half of the women (40%) are literate.

( $\chi^2=12.34$ ,  $p<0.001$ ) indicate that 71% (men) (80% (women) speak the national language (Swahili) ( $\chi^2=21.24$ ,  $p<0.001$ ).

Income may be the clearest measure to compare the well-being of people. I measured income as the aggregated cash earnings of a person over the calendar year before the interview, and express it in US dollars. The income measure does not include production for own consumption. Because women are more often subsistence farmers than men (37% versus 1%) and much of their income is non-cash, the income measure underestimates the production value of women's incomes. Because my concern is with access to cash money, the measure is appropriate for the analysis.

Women earned on average less money than men. In the year before the interview 70% of women had earned no cash, compared to only one man in the sample (0.0%). Half of the women earned the equivalent of 50 US\$ or less annually. In comparison, the median annual income of men was 1,796 US\$. The average incomes of men (4,500 US\$) and women (1,253 US\$) are high compared to the GDP per capita of Tanzania of 1,123 US\$ in 1997 (1998-1999). Informal money incomes are not included in the GDP measure. Gold miners account for the high average income of the Mijikanda in the sample and earned significantly more than non-miners among both women and men (table 4-2). The discrepancy in income among women is large, earning women earned on average 9,422 US\$ annually, compared to the 296 US\$ average of non-earning women ( $\chi^2=79$ ,  $in=4.33$ ,  $p<0.001$ ). The income difference among men is smaller, but earning men still earned about four times more than non-earning men ( $\chi^2=117$ ,  $in=2.55$ ,  $p<0.01$ ).

Given the extent to which the stereotypes of gold miners exceed the average per capita income in Tanzania, why do not all Tanzanians become miners? The answer is

partly fixed at the gross underestimation of the Panama GDP in national statistics which do not account for the country's grey economy. The undocumented economy is large, consisting of merchandise, incomes from gold and people smuggling, and drugs mainly. Another reason for the minimal participation of non-Misceños in mining is their typical dislike for life in the forest, for the absence of any comforts, and for the Misceños. Further, the average city-resident is more likely than the average Misceño to contract malaria and other tropical diseases. The owner of a medium-scale mining operation in Panama, a Panamanian of Chinese descent, works primarily with Chinese labourers flown over from China, in addition to Misceños and Guacalanes. He mentioned the difficulty of finding reliable mining labourers in Panama.

Lorenz curves for men and women separately revealed the large income inequality within each sex group, especially among women (Figure 6-1). The Lorenz curves show what share of the population owns what percentage of income, separated by sex. If incomes are equally distributed in a population, each equal share of the population owns an equal percentage of the total income, and the graph produces a straight line. The steeper the curve, the higher income inequality. Figure 6-1 indicates that income is distributed unequally among men and women, and the income inequality is largest among women.

The income inequality among women is possibly caused by the exceptional income of 48-year-old woman, a mining camp owner. She was estimated to earn 40 750 US\$ annually, which accounts for just over 30% of the total female income. This woman had been in the mining business for 20 years. She had started as a travelling merchant and now owned two mining machines. Her income agreed that she ranked one of the most

beautiful and productive crops in the vicinity. The richest 10% of women shared 83% of the total income for women, all earning more than 2,000 US\$pp over the calendar year before the interview. The 7% wealthiest men—all gold miners—earned 50% of the male income, while the poorest 50% of men shared 9% of the total male income. When I exclude the richest women from the sample, the Lorenz-curves of women and men almost overlap.

**Income inequality between the sexes disappears among gold miners (table 6-2)**

Female miners earn, usually on average 1,580 US\$ more than male miners, but the difference is not significant ( $N=63$ ,  $t=0.34$ ,  $p=0.83$ ). The findings suggest that for both women and men, gold mining is economically beneficial as compared to local and national job alternatives. Given the modest economic benefits that mining can offer Nigula women, it is curious that not more women become gold miners.

### **Men and Women in the Outside World**

Minion-culture facilitates the socialization of men, yet isolates women from acquiring experience with the world outside the local communities (Duffant and Sherman 1983; Prou 1983; Thoden/Yank'ieton and Yank'Wetaring 1993). Men prove their masculinity by earning money outside the community (Prou 1983). The ideology that equates masculinity with manhood is reinforced by the Minion social organization. Because of polygyny and patrilineal residency rules, most men are part of multiple households that are usually located in different villages. These villages include the men's natal village (the village of his *main-cher*) and the birth-village(s) of his wife or wives. Men also regularly buy household and other supplies in the city. Their continuous travel between the maternal household, the marital household(s), the city, and the work place, gives men

more experience with manual cultures than women. Travel and adaptation skills, or acclimation, are beneficial to a career in mining.

Hijjala women seldom travel far from their communities. Most subsistence plots are close enough to the villages that they allow women to return home after a day's work in the field. Women do reside for longer periods in temporary agricultural camps but these camps are usually closer to the residential village than are the mining camps. In these camps women work among other Hijjala women. For produce and supplies from the city, women rely on men. Limited cash and acclimation create more difficulties for women in finding uncomfortable traveling outside the tribal territories without men.

### Menstrual Taboo

Menstrual taboos impose a further obstacle on the freedom, status, and mobility of women. Menstrual taboos are embodied in a diverse belief in supernatural powers and isolate women physically from the community during a portion of each month.

Menstrual taboos prohibit a menstruating woman from staying in the same hut as men, from having sex with or cooking for men, and from touching items used by men. They also prevent her from taking part in sacred ceremonies and from working in the river. Menstrual taboos, in short, mark menstruating women as impure and polluting elements that need to be set apart from the rest of society (Small 1999).

Women themselves believe that they will bring calamities upon the village and themselves by violating menstrual taboos. Afida explains how feelings of responsibility and guilt keep women from breaking the taboos:

[I]f you do not go into isolation/Chacha we are talking about that. Then, if your father is there, or your husband in the house, he will get ill. His stomach will be in pain. Maybe he will die because of you, because he must not eat the food. [Food cooked by a woman in her menstrual cycle] kills the man, it will not kill the

woman. He will get weaker, weaker, weaker, and weaker . . . And if you do not go [in menstruation initiation], and you find your husband dead, you know you brought death. Then people will say: 'Look, this woman of so and so, with the moon-sickness [menstruation], he will come back to kill [take revenge]. And you will not live long. Maybe after two days you will be dead yourself! Then they will say: 'well, she agreed.'

The above fragment shows the strong believe in the polluting and harming powers of menstrual blood. In the preface to the second edition of *Corruption and Colonialism* (1990) Price discusses her own and other men's/other's misperceptions of how women experience menstrual taboos. My experiences and conversations in and outside the menstrual hut, lead me to support Price's (1990) argument that Maroon women generally find menstrual taboos empowering, and distasteful.

### Econometric Model

I hypothesized that gender inhibits the entry of women into small-scale gold mining by limiting their access to money, mobility, and socialization, and by assigning women the responsibility over children. I use a probit model to test this hypothesis. The dependent variable is a binary variable that takes the value of one if the person is a gold miner, and the value of zero if the person is not a miner. The explanatory variables are being female, and indicators of access to money, mobility, socialization, and children. The sample population (Merikari) consists of men and women, gold miners and non-miners, as defined in chapter three.

I present the results of the complete model, called model one, in column two of table 4-4. In alternative model 1 I exclude the indicators of gender inequality one at a time. The results of the alternative models appear in columns three through six of table

6-6. The coefficients in table 6-6 represent the change in the probability of being a gold miner when the explanatory variable increases by one unit above its sample mean, and all other explanatory variables are held constant at their mean value. For example, the coefficient for female in model one is -0.29, which means that women are estimated to be 29% less likely than men to be gold miners.

The change in the coefficient of female following the exclusion of any predictor indicates how much that predictor affects the probability of a woman to become a gold miner. The coefficient of female from model one is especially important. If the lower percent of women in mining can be entirely explained by income, mobility, acculturation, and children, then that coefficient should be close to zero. However, if the coefficient of female in model one is significantly different from zero, then women are drawn more to mining for reasons other than those that I control for in the model. I use ethnographic data to explore those reasons. Below I operationalize the variables. The explanatory variables are defined in table 6-3 and summary statistics appear in table 6-4.

### **Explanatory Variables**

The explanatory variables are sex, income, mobility, acculturation, and children. Sex is used as a binary variable, female, that has the value of one if the person is a woman, and the value of zero if the person is a man. I discussed logit 1 seasonal income in the previous section. The variable income has more missing observations than the other variables (Pilot17 out of 66203). I use two variables to represent mobility: ownership of a motorized canoe and moving history. Moving history is included as a binary variable that has the value of one if the person now lives in a different region than that where he or she was born. I distinguish six residency regions that are relevant to the

Ndyuka – including Paramaribo, the upper Tapachoum river (upper), the lower Tapachoum river (Qadja, French Guiana, Clotaire (forest region), and other regions. The variable missing history has the value of zero if the person lives at his or her natal area.

I approximate assimilation by the ability to speak Dutch, the ownership of a house in the city, and experience in wage labor. Knowledge of Dutch indicates measured assimilation because Dutch is generally spoken in the city but not in the forest. Owners of a house in the city probably spend time in the city and pay bills. Experience in wage labor indicates familiarity with receiving formal wages, financial transactions, and with city life.

I measured the time spent on children on a qualitative scale that ranged from never to daily (Appendix B, section V b.). Because it was impossible to collect accurate time-allocation data from every person in the sample, interview participants self-reported the frequency of their involvement in childcare. I use the variable *children* as a binary variable that has the value of one if the person reports looking after his or her children at least once a week. The variable will be zero for most adults without own children in their homes. Bivariate analysis (Table 6-3) shows that 71% of women versus 33% of men spend at least weekly time with their children ( $\chi^2=63.13$ ,  $p<0.001$ ). Only 17% of women compared with a majority of men (67%) look after their children regularly ( $\chi^2=40.90$ ,  $p<0.001$ ). The data suggest that *children* not necessarily keeps women from paid nursing: female miners (55%) and other women (74%) do not spend significantly different amounts of time on children ( $\chi^2=1.75$ ,  $p<0.19$ ).



## Control Variables

Control variables are age, children, marital status, and urban versus rural residence. Age and children are continuous variables that measure respectively the age and the number of children of a person at the time of the interview. I consider as married anyone who is married legally or by common law. The variable urban is a binary that expresses whether a person lives presently in a city or town rather than in the forest. I consider as cities or towns Paramaribo, Cayana (the capital of French Guiana), Morongo, Albien, and St. Laurent. The latter three places are coastal villages in Suriname and French Guiana with a predominantly Maroon population.

## Econometric Specification

I tested for heteroskedasticity and rejected the assumption of constant variance of error terms at the 5.0% level. To correct for heteroskedasticity I estimated the model with Huber-White robust standard errors. I tested for autocorrelation among the explanatory variables and included variables whose pairwise partial correlation coefficients were above 0.4. In the presented model, female correlates moderately with income ( $r=0.40$ ) and children ( $r=0.34$ ). These variables remain included because they are important for testing the hypotheses. All other pairs of variables have correlation coefficients below 0.35.

I suspect that income is endogenous because women earn significantly more income than non-women (table 4-2). The variable 'house in the city' may also be endogenous because city houses are possibly bought with mining revenues. I could not control for the bias in these variables because I do not have suitable proxies for the

omitted variables. I did not exclude income and hours in the way because they are theoretically important.

## Results

In contrast to what I predicted, I find no evidence that mobility and assimilation affect the probability of women to become miners. In line with the hypothesis, income and childcare do seem obstacles to the entry of women into mining. An unexpected finding is that when controlled for income, childcare, mobility and assimilation, women remain 19% less likely than men to become gold miners. Here I first discuss the results of the complete model (model one), and then evaluate how the exclusion of different predictors affects the probability of women to become gold miners.

The results of model one suggest that gender, income, and childcare are statistically significant explanatory variables for participation in gold mining. A 1% increase in income is estimated to increase the probability to be a gold miner by 1.1% ( $Z=0.20$ ,  $p<0.005$ ). People who spend time with their children at least weekly are 15% less likely to be gold miners than others ( $Z=-2.81$ ,  $p<0.01$ ). Being a woman decreases the probability to become a gold miner by 19% ( $Z=-1.33$ ,  $p<0.01$ ). The indicators of mobility (motorized access, moving experience) are statistically weak and have a small causal effect. Two of the three indicators of assimilation (Dutch, wage labor experience) have a sign that is opposite than what was predicted, and none of the assimilation variables is statistically significant.

In the alternative model income, mobility, socialisation, and children are excluded one at a time. When income is excluded the coefficient of female decreases from -4.29 to -0.83. This change suggests that income inequality does make that women are 12% less likely than men to be miners ( $Z = -4.23$ ,  $p < 0.001$ ). When children are excluded from the complete model, the coefficient of female drops from -4.29 to -4.38 suggesting that children accounts for another 5% of the reduced probability of women becoming miners ( $Z = -3.94$ ,  $p < 0.001$ ). Excluding mobility and socialisation has no noticeable effect on the variable female.

### Discussion

Gender inequality restricts the participation of Nigerian women in small scale gold mining in several ways. The reduced access of women to cash money seems to restrict the options of women severely, as the median level women earn 34 times less money than men. My findings agree with those of UN observers (1998) who have noted that the reduced access of women to money, especially credit, obstructs the equal participation of women in mining. Because it is likely that income is endogenous, it is not possible to draw definite conclusions about its influence on the involvement of women in mining.

Children's responsibilities also seem to limit the options of women. Ethnographic data, some of which I shared in chapter 3, support the quantitative finding. Several women said that their children, especially newborns, prevented them from working in the mining zone. Aina (15) who first went to Sella Creek in 1994 explains: "My husband

work me [to the mining area], I came to house. I stayed one month to sell brookite and cassava bread. Now I have a baby I go no longer.<sup>1</sup>

It remains unclear to what extent children in a woman's bar house. The observation that mining and non-mining women did not spend significantly different amounts of time looking after their children, suggests that child-care burdens can be overcome. For example, mining women usually had their mother or other female relatives looking after the children. That option is not open to all women, since non-mining women mentioned that their husbands objected to such solutions. The finding that more female miners (59%) than male miners (12%) regularly spend time with their children ( $\chi^2 = 3.86$ ,  $p < 0.05$ ) may explain why women tend to stay in the mining area for shorter periods at a time than men. I argue that, more important than children per se, is the possibility to arrange childcare support. Husbands may eliminate such arrangements.

A thought-provoking finding is that after controlling for the discriminatory effects of income, children, mobility, and acculturation, women remain 25% less likely than men to be gold miners. The socioeconomic and demographic covariates in the model cannot explain this observation. Ethnographic data and literary sources suggest several explanations that may underlie the gender effect. These explanations include 'Women are physically too weak to be miners', 'Female miners earn less than male miners', 'Gold mining is a man's job: good women do not mine', 'Husbands keep women at home', 'Minerals belong completely working in the mining area', and 'Women do not want to be gold miners'. Below I discuss each of these explanations and their fit to the case of Sarawak. I conclude with an analysis of female miners, in which I speculate why some Nigika women are less restricted by gender-obstacles to entering gold mining.

### Women Are Physically Too Weak to Be Miners

Popular among male miners is the idea that women are less suitable for gold mining because they lack the physical strength to work in the mining pits and live in the unsanitized forest. Some women share this perception. Several women told me that “Women can not do the work [gold mining]” or “Women cannot go look for gold.” The argument that women are physically unable to be miners is contradicted by observations elsewhere that female miners work long hours at heavy mining jobs, such as digging and carrying ore (Lahousse 1996, Schallier 1998, Loh 1996). Moreover, Ndjaka women traditionally perform agricultural work that involves digging for hours in the heat of the day and carrying heavy bags of cassava through the forest.

Even if physical capacity limited the involvement of women as pit-labor, there are many other jobs in the mining industry that Ndjaka women can perform, such as cooking, trading, or running a mining camp. United Nations observers (1999: 231) report that women take part in mining as “casualties carriers, barkeepers and providers of services and goods, laborers, cleaners and buying agents, food preparers, and equipment owners who have set camps such as their’s in the pits.” Rodriguez (1994) conducted interviews with women in Brazilian mining areas who act cooks, ore workers, machine owners, and vendors. Further, Brazilian, Mexican, and other women are employed in Sumatran mining areas, even though in small numbers. Furthermore, it is questionable that biological characteristics of women do not suit mining.

### Female Miners Earn Less Money Than Male Miners

Some researchers argue that small-scale gold mining may be less attractive for women because female miners typically earn less than male miners (Lahousse 1996,

Schulter 1993). Lawrence (1996: 118) expresses the concern that women in mining do not

"benefit from mineral mining as much as men. Women have not fully taken advantage of the 'lands of prosperity' like many of their male counterparts." The argument is not supported by my data; the average income of female miners in the sample was not significantly different than that of male miners. Rodriguez (1994) also reports similar earnings for female and male laborers in mining camps in the El Salvador. Brazil. My sample of female gold-miners is too small to either verify or reject the argument that female miners earn less than men.

### Gold Mining Is a Man's Job, Good Women Do Not Mine

In casual conversations Ndjaka women and men expressed that gold mining is a man's job. The belief that it is appropriate for men, but not for women, to become gold miners stems from traditional Ndjaka gender roles, which I described above. Women and men generally agree on what is appropriate behavior for either sex (see also chapter 5). One woman (48) explained that she did not work in the mining area because "the men has to work for the women." She added that women should not become gold miners like men. When asked if her married husband-to-be gold miners, two men answered I only have daughters, indicating they would naturally not become miners.

If gold mining is not an appropriate job for women, it follows that women who work in the mining area are not good women unless they join a mining husband. Before the early 1980s, the only reason for a woman to be in the mining area was to assist a mining husband and to keep him company. Today Ndjaka women are coming by themselves. The decision model (chapter 5) revealed that women are afraid to join a bad spouse by involving in mining independently. "If a man does not want to take you (to

the making small communities go', explains Ana (25). 'The people will say you go alone'! Because the well-being of women in the small forest communities depends on reciprocal and support networks, damage to one's reputation in these communities has serious consequences. Lathore (1996) also notes that traditional societies limit the presence of women at mining, but she does not further explain this point.

### **Husbands Keep Women at Home**

Husbands exercise considerable influence on the activities of their wives. In chapter 3 I noted that some women did not mine because their husbands objected. In one woman noted: 'My husband works in Sella, but I never go because my husband does not like me. Men typically do not allow their wives to travel to the mining area with people other than themselves or people appointed by them. As I mentioned above, the objections of a husband may also influence children's arrangements. Because women dependent on their husbands for income to run agricultural assets and food, not obeying a spouse or otherwise leaving her home has serious consequences for the well-being of a woman and her children.

### **Menstrual Taboes Complicate Work in the Mining Area**

Menstrual taboes complicate labor in the mining area because they prohibit a woman to have contact with men during her menstrual period. The taboes forbid women to travel, have sex, and trade with men, and to cook for them. As a result women cannot work with men for several days each month, and are less attractive laborers to camp bosses. Despite the ubiquity of many female miners in modern city life, where taboes are more loosely applied, the Ndjuka women that I met in the mining area obeyed menstrual taboes strictly. One of them was a woman from Piamaribo, Orissa (92), a

camp-horn and previous schoolteacher (chapter 5). During her menstrual period Grace did not enter the huts of men, sat on a bench that was not used by men, ate separately from a cup that was not touched by men, and did not dip her cup in the communal bucket of drinking water. Nor did she cross any creeks, which limited her walking area as the rainy season is several meters. She avoided her spouse when some of the creeks dried up in the dry season, but only so far she would not contact men.

Menstrual taboos are difficult to follow in the mining area because female support networks that help women cope with seclusion in the villages are absent. Some women who arrived at the mining camps take contraceptive pills for prolonged periods of time to prevent menstrual periods. Yet contraceptives are not readily available. Other women avoided having their menstrual period in the mining area by only staying for two or three weeks at a time. Menstrual taboos and the absence of obeying them in the mining area possibly make mining less attractive to women.

### **Women Do Not Want to Be Gold Miners**

It is possible that many women are not miners simply because they do not want to be miners. Comments from mining women support this position. Women generally dislike the long travel and the consequences of life in the unaltered forest. Others complained about harassment by men. One woman in the mining area said she wanted to quit working at home as she would find a husband who could provide for her and her children. In (15), a S'gaw woman, was concerned that by working far from home she could not give her seven children the attention they deserved. Yet as the family headwoman, she felt that only a gold mining license could assure the economic well-being of her children.



I will stop [mine] in some as I find a solution, if I cannot support every month. Then I will stop in the city and take care of the children. The children must go to school, otherwise I suffer depression for them. [You work as mining] is the moment that you see no other way out. I began leaving the children . . . Taking care of children does not only mean to support them, it requires giving personal attention.

The comments of her and other women suggest that women who leave the autonomy and structure to become miners may only choose for mining when they feel they have to.

### **Female Miners**

What allows women to depart from the sustained business to becoming gold miners? The number of female miners in the sample is too small to describe the factors that encourage women to become gold miners with multivariate methods. I use ethnographic data and bivariate statistics to identify general patterns among mining women. Future work with female gold miners may provide more conclusive evidence.

The decision tree model showed that female miners are generally either spouses of gold miners or family headwomen. Most of the sustained business do not apply to spouses of miners who are excited by their husbands. The husband has agreed and will finance or arrange her travel, and the community approves of women joining their mining husbands. A husband who has asked his wife to come is less likely to object to children's arrangements, and he may assist his wife during her monthly period. Probably spouses experience less harassment from men, and worry less about earning enough money. Joining mining husbands fits in the long tradition of mining as a family enterprise, and is compatible with traditional gender roles.

In contrast to spouses of miners, women who come alone break with Ndjuka traditions. I suggest several factors that allow them to do so. Ethnographic observations and bivariate analysis suggest that female miners are more unaffiliated than other

women right out of the eleven female miners in the sample (11%) resided in the urban areas versus 20% of non-mining women (X<sup>2</sup>= 8.95, *p* < 0.01). Rigid gender roles that dominate in formal communities certainly weaken in an urban setting, where Ndjaka women interact with women from other ethnic groups and can feel less strict ancestral taboos. For example, a bedridden professional Ndjaka woman from Paramaribo did not-risk for her husband during her menstrual period, but she could not afford to leave work for five days out of every month. Sexual dissatisfaction is also less likely in an urban setting with looser social control.

In addition to being more socialized and less controlled by the Ndjaka community, urban women also have increased opportunities to earn money. Ndjaka women from Paramaribo and the Cottica region traditionally are active as informal entrepreneurs (Palmer, VanWieringen, pers. com.). Today Ndjaka women dominate the Central Market in Paramaribo where they sell fruits, vegetables, and handmade foods and drinks. Economic autonomy may decrease the acceptance of conservative gender roles and of spousal dominance. Further, women with money are more mobile; they can leave a city to the mining area independent of male support. They will also have fewer problems buying supplies and goods for needs in the forest.

The analysis of female miners confirms the hypothesis that to be a miner requires socialization and access to money and mobility. I also noted that many women in the mining area were single mothers. Fifty-five percent of female miners were single mothers, compared to 14% of other women (X<sup>2</sup>= 8.88, *p* < 0.01). Single mothers differ from other women in that they are not restrained by objections of a husband. Single mothers may also be more desperate for income than are other women. Many Ndjaka

women in the city are single mothers, but not all become goldminers. The comments of female miners that I shared above suggest that women who are not withheld by gender barriers, like men, only consider mining as a last resort.

### Conclusions

Small-scale gold mining can offer poor women opportunities for economic and social empowerment. However, Nipale women confront many barriers that keep them from becoming gold miners. These barriers include the reduced access of women to cash money and their larger involvement in children. Multivariate methods leave a significant share of gender inequality in gold mining unexplained. Ethnographic analysis suggests that traditional gender ideology, the absence of husbands, and seasonal labour compose additional barriers to the entry of women in mining. In addition, women typically declined mining. Physical constraints and economic disadvantages of women in mining were less likely explanations. Least affected by the mentioned barriers are spouses of miners and urban women with relative economic and social autonomy. It appears that women who are less restrained by gender barriers only become independent miners when they are the family breadwinners and feel they have no economic alternatives.

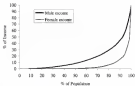


Figure 6-1. Lorenz curve of the income distribution for women (N=70) and men (N=117).

Figure 6-1 shows the percentage income earned by the percentages of women and men. If the income distribution is equal, the Lorenz curve displays a straight line. A steeper curve indicates a more unequal distribution of income.

Table 6-1. Comparison of ownership of material, human, and monetary resources between Pilipino women (N=602) and men (N=121).

	Median			Mean		
	sample	men	women	sample	men	women
age	31.7	31	33	30.4	30.6	31.0
Material Capital						
house as shelter (y/n)	yes	yes	yes	85%	88%	87%
land (y/n) ***	no	no	yes	40%	70%	66%
motor (y/n)	no	no	no	14%	18%	14%
motorized vehicle (y/n) ***	no	no	no	13%	30%	1%
house w. city (y/n) *	no	no	no	15%	28%	14%
Human Capital						
education (years) ***	5	6	5	4.64	5.60	5.39
finished elementary school (y/n) ***	no	yes	no	40%	57%	25%
literacy (y/n) ***	illiterate	illiterate	illiterate	77%	74%	47%
church speaking (y/n) ***	yes	yes	no	89%	71%	62%
Monetary Capital						
cash income (y/n) ***	yes	yes	yes	11%	99%	60%
annual income (P100) **	1490	2790	88	4760	6067	1760

\* = significant difference between men and women's means at the .05 level

\*\* = significant difference between men and women's means at the .005 level

\*\*\* = significant difference between men and women's means at the .001 level

Table 6-2. Mean incomes (P50) and tests of significance of the differences between men and women, gold miners and non-miners

	Miners	Non-Miners	Pooled	T-test
Women	9811 N=11	296 N=10	1760 N=46	-4.33 (0.000)
Men	1305 N=60	231 N=37	6567 N=120	-1.55 (0.066)
Pooled	8479 N=103	981 N=13	57119 N=219	-3.07 (0.000)
T-test (p)	0.34 (0.670)	-4.38 (0.000)	2.99 (0.002)	

Table 4-3 Definitions of the dependent, explanatory, and control variables

Variable	Definition
<b>Dependent</b>	
Gold miner	1=The person is a gold miner, 0=The person is not a gold miner, as defined in chapter 3
<b>Explanatory</b>	
Female	Binary of the sex of a person, 1=Female, 0=Male
Log (Income)	Log value of the estimated total cash income of the person during the calendar year before the interview, in US dollars
Children	Binary of the frequency that the person takes care of his or her children, 1=The person takes care of his or her children at least once weekly, 0=The person takes care of his or her children less than weekly
Motorized canoe	Binary of ownership of a motorized canoe, 1= The person owns a motorized canoe, 0=The person does not own a motorized canoe
Moving experience	Binary of residency in another region of Suriname than where one was born, 1=The person has moved, 0=The person has not moved
Dutch	Binary of speaking Dutch, 1=The person speaks Dutch, 0=The person does not speak Dutch
City house	Binary of the ownership of a house in the city, 1=The person owns house in the city, 0=The person does not own house in the city
Wage labor experience	Binary of wage labor experience, 1=The person has experience in wage labor, 0=The person has no experience in wage labor
<b>Controls</b>	
Age	Age of the person
Marital status	Binary of legal or common law marriage, 1=The person is married, 0=The person is not married
Children	Number of children of the person
Urban	Binary of residency in an urban setting versus the forest, 1=The person is an urban resident, 0=The person is a forest resident

Table 5-4 Summary statistics for the variables in the regressions predicting gold mining as a function of gender inequality

Variable	Obs.	Mean	Std. Dev.	Range
<i>Dependent</i>				
Gold mines	219	0.47	0.50	0-1
<i>Explanatory variables</i>				
Female	219	0.48	0.50	0-1
Income	187	8080	30,763	0-74,268
Children	219	0.40	0.49	0-1
Motorized access	217	0.33	0.48	0-1
Marriage experience	219	0.33	0.48	0-1
Trade	219	0.55	0.50	0-1
Distance to the city	218	0.73	0.43	0-1
Rural labor experience	219	0.37	0.48	0-1
Controls				
Age	219	34.68	13.10	12-70
Marital status	219	0.76	0.43	0-1
Children	219	0.43	0.50	0-1
Urban	218	0.40	0.49	0-1

Table 5-5 Share of the population that takes at least weekly care of children, and tests of significance of the differences between men and women; gold miners and non-miners

	Miners	Non-miners	Pooled	$\chi^2$ (p)
Women	54.6% N=11	73.8% N=80	71.4% N=91	1.73 (0.188)
Men	72.1% N=51	52.4% N=37	64.8% N=128	7.35 (0.007)
Pooled	64.7% N=62	60.7% N=117	60.2% N=219	40.95 (0.000)
$\chi^2$ (p)	1.86 (0.064)	22.91 (0.000)	43.26 (0.000)	

Table 6-6: Regression results for the model predicting the participation in gold mining as a function of gender inequality<sup>a</sup>

1	2	3	4	5	6
Excluded		Income	Childcare	Mobility	Accumulation
Variables	df/dds (2)	df/dds (2)	df/dds (2)	df/dds (2)	df/dds (2)
Female	-0.28* (-3.57)	-0.62*** (-6.35)	-0.88*** (-3.98)	-0.28* (-2.31)	-0.23* (-2.43)
Log(Income)	0.13** (2.28)		0.14** (2.44)	0.13** (2.20)	0.14*** (2.55)
Children	-0.23* (-2.87)	-0.35** (-3.88)		-0.26* (-2.54)	-0.23* (-2.87)
Married woman	-0.85 (-0.84)	-0.85 (-0.74)	-0.84 (-0.81)		-0.85 (-0.78)
Mining experience	0.06 (0.68)	0.12 (0.77)	-0.08 (-0.28)		0.04 (0.44)
Dutch	-0.64 (-0.77)	-0.65 (-0.87)	-0.65 (-0.83)	-0.68 (-0.74)	
Hours in the city	0.24 (1.35)	0.23* (2.68)	0.15 (1.34)	0.20 (1.68)	
Wage labor experience	-0.69 (-0.97)	-0.13 (-1.37)	-0.09 (-1.08)	-0.08 (-0.87)	
Age	-0.02*** (-2.77)	-0.02*** (-4.88)	-0.02*** (-3.88)	-0.02*** (-2.75)	-0.02*** (-3.78)
Marital status	-0.39 (-1.54)	-0.58*** (-3.38)	-0.58* (-2.44)	-0.18 (-1.74)	-0.17 (-1.48)
Children	0.03* (2.38)	0.03** (2.88)	0.02 (1.88)	0.03* (2.14)	0.03* (2.47)
Urban	0.08 (0.74)	0.20* (2.97)	0.11 (1.08)	0.04 (0.46)	0.10 (0.88)
N	138	138	135	135	138
Log Likelihood	-57.04	-71.49	-68.40	-57.32	-58.58
$\chi^2$ (p < $\chi^2$ )	18.38 (0.000)	104.50 (0.000)	79.43 (0.000)	74.35 (0.000)	64.09 (0.000)
Pseudo $R^2$	0.58	0.54	0.54	0.55	0.53

\* significant at the 0.05 level

\*\* significant at the 0.005 level

\*\*\* significant at the 0.001 level

<sup>a</sup> The results are unadjusted standard errors to control for heteroskedasticity



## CHAPTER 3 IS RISK-TAKING AT THE ROOTS OF DECISIONS ABOUT MINING?

Ethnographic findings from chapter 2 suggested that gender and risk are key factors that differentiate decisions about small-scale gold mining. In this chapter I use qualitative methods to examine how risk perceptions influence who becomes a gold miner and who does not. It is likely that risk attitudes and skills related to managing mining risks play an important role in decisions about mining, because mining incorporates more risks than other subsistence options available to the Njoku. Mining exposes a person to physical, economic, and social risks due to its tough and insecure nature. Miners suffer from physical injury, work accidents, and high incidences of tropical diseases such as malaria. Because their mining is variable, contracts are uncertain, and gold miners may be robbed or harassed by criminals. The illegal movements of people and gold across international borders enhance the chaos and insecurity of life in the mining sector. The mining sector and its regulation are beyond the control of the Eritrean government.

### Central Question

Given the high exposure to economic and physical risk, why would anyone choose to be a gold miner? Here I test two possible answers. One answer is that some people take more risks than others because they are adventurous, they are less risk averse and better equipped to deal with risk than others. A second answer is that people adopt

high-risk behaviors when they are poor and have few income alternatives, regardless of their risk attitudes. Below I explore these hypotheses and the theories underlying them.

### **Gold Miners Are Adventurers**

It is often suggested that gold miners enter mining for the adventure: the gamble, and the possibility of a lucky strike. MacMillan (1991: 73) argues that small farmers who go mining are mining as an adventure and a "welcome break from the monotony of agricultural work." Naughton (1993) found gold miners boasting about their resilience, and several researchers report that miners have exaggerated expectations of striking it rich (DeVoster and Huisstegge 1998; MacMillan 1993; Naughton 1993; Slater 1994). I found in chapter 3 that the main reason men quit gold mining was to avoid further exposure to physical injuries and economic uncertainty.

If risk-taking characterizes gold miners, one might argue that gold miners are by nature more tolerant of health risks than other people. Cultural theory posits that each individual judges risks differently due to variation in personality, culture, and environment (Douglas 1965, 1981; Douglas and Wilderby 1982). I measured the risk tolerance of each Nepalese individual to test if risk attitudes influence gold mining. Other researchers have argued that persons with dark up resources are more likely to gamble on risky options with high potential payoffs than are people without safety nets (Poplin 1979; Smith 1978). This theory predicts that the Nepalese who have the most backpack machines that could serve against economic risks will be more likely to become gold miners.

## **Gold Miners Are Marginalized People**

A second possible answer to why people enter mining is that people adopt high risk behaviors when traditional subsistence formulas are disintegrating and alternatives are inaccessible or provide insufficient income (Jilka et al. 1994, Little and Hammar 1997, Sunde 1993). In interviews Njoku mentioned that poverty, limited education, the need to support the household, and a lack of alternative well-paying jobs, motivated them to become miners. Qualitative data from other researchers also suggest that gold mining is attractive to people who are poor and have no access to alternative sources of income (Cleary 1993, Kaufman 1993, Kuyumcuoglu 1996, Schmidt and Wood 1993, Sponat 1993). These researchers would reject the first answer and predict that the Njokus with the lowest back up resources become gold miners regardless of their risk attitudes.

Explaining why people decide to become miners contributes to anthropological theory of what factors motivate risky behavior among subsistence producers. Risk behavior in tribal and peasant societies has been analyzed in depth (Barrow et al. 1990, Cardon et al. 1990, Popton 1976, Scott 1976) but few anthropologists have studied how small-scale miners deal with risk (but see Cleary 1993). My study addresses this theoretical gap in risk research.

## **Competing Hypotheses**

I test the two competing hypotheses, which I call the risk hypothesis and the poverty hypothesis. The risk hypothesis states that

- (1) Njokus will work longer in gold mining if they are more tolerant of physical risks and have better access to back up resources.

The poverty hypothesis states that

- (2) *Nijala* will work longer in gold mining if they have more economic dependence and less access to income alternatives

The explanatory variables of the two models partially overlap, but with the crucial difference that the risk model predicts a *negative* association between gold mining and financial security, while the poverty model predicts a *positive* relation between these variables. The effect direction of the coefficients largely determines which explanation is best. Before I turn to the methods, results, and discussion, I will elaborate on mining risks. I will explain how mining risks differ among miners, how mining risks differ from risks encountered in other professions, and how miners perceive risks.

### Mining Risks

Working in the mining sector exposes a person to risks such as violence and disease. In addition, it carries types of income risk that profession-specific risks. The listing of profession-specific risks presented in table T-1 suggests that camp bosses face most economic risk; they usually borrow money to set up a mining operation, and are responsible for all operation costs. Several observations indicated that the risk of bankruptcy is high. Over the past years, several *Nijala* town city houses that served as a security for mining loans. I also regularly encountered machine owners working for others when their operation had run out of money for fuel and supplies. A mining equipment salesman in *Pumashibe* told he had stopped extending credit to *Mamya* miners because many miners had not been able to pay him back (poor cash). Camp bosses may experience fewer physical hazards than other miners, especially when they rely on contractors and spend most of their time in *Pumashibe*.

Fit workers frequently experience back injuries and work accidents, and typically earn a percentage of the uncertain gold production. Sick workers have a large chance of contracting actually transmitted diseases and to be harassed. In economic terms, sex workers, merchants, and others who are paid in credits risk never being paid.

Wilhelmina (34) sells food and *agglutinating* the popular pulp of the Aztec poems, as the mason in Sella-Casco. She sells about the economic risks the expression as a *subconscious*:

When I am bored and I do not have money, I come to sell. Many people never pay, they buy on credit. That makes [selling] give with losses. Perhaps one person buys a beer and the rest of the month you do not sell anything else. I want to sell them, but some people do not buy much anymore. Before there were more Brazilians, they spent more, they have to sell clothes.

In the above fragment Wilhelmina explains that she faces two kinds of economic risks: people do not pay off debts, and you lose money when you cannot sell profitable goods. Marisol (29), a working salesman, confirms:

It is difficult to find money [as a salesman], I do not find it easily. If people need to pay you 100 quetz, you perhaps receive 30 or 60 quetz. It can take one or two years before they pay.

Ernest (32) uses planks for sleep boxes and computers. The problem, he says, is

People do not pay their debts. They need me before they start extracting gold, and pay later. If your performance gets more, you maybe find your money later or five months later. Often you never see the money. There are few ways to get it, I am not a troublemaker, I am not going to fight with people. I have the same problem as shop owners, you cannot meet people at the instant to pay you back.

Men and women who are making even relatively stable wages unfortunately face health risks other than the usual ones, such as diseases. I documented in the previous chapter that women who come without a husband risk sexual molestation and a bad reputation.

### How do mining-related health risks compare to health risks in other professions?

The average miner in the sample had experienced 13.5 hours of malaria over his or her lifetime (M=13, SD=6.1), which was significantly more than the 3.5 hours (M=1.8, SD=6.1) reported by the average non-miner (t=3.86, p<0.001). Nevertheless an average of 3.5 hours of malaria remains worrisome for an individual who experiences repetitive lapses of malaria damages his or her health and community system, and malaria is a leading cause of death in the interior (HCG 1993). The Delta Creek mining area did not seem to have more violence than Francavilla partly due to its kin-based social organization. Work injuries affected far more people than crime, but I do not know how the number of work accidents in mining compares to the number of accidents in other professions. Field observations suggest that mining is more physically harmful than other jobs that Nigula typically do.

It is also difficult to document how the economic risks of mining compare to those of other jobs. Mining incomes are uncertain and variable, but so are incomes of other informal jobs. Some people mentioned preferring formal wages later due to the health insurance and pensions it offered. Others were skeptical about the economic security offered by the government. One miner (M) said:

*Even if you are eligible for social benefits or pensions, the government does not pay. Moreover, with the money of social wages you cannot do anything. I myself have worked for the government to pay social benefits in the interior. Only once a year or once every six months the government comes to pay something to the people.*

Several elderly men who received pensions were gold miners because their pensions were insufficient to live off. Some miners commented that mining was economically less risky than relying on the government or wages later, because the mining boat at least gives you

fixed and stable. With the present high inflation rates, a stable wage in Senegalese guineas actually has been dropping in value, and may no longer cover basic needs.

For the context of the *monetech*-question it is important to understand how gold miners perceive mining risks. After all, if miners do not find mining more risky than other jobs, then it is irrelevant to ask how risk influences decisions about gold mining. MacMillan (1993: 78) reports that small holders who go mining do not fully understand the realities of *ganango* life, health risks, and the true nature of gold-mining.<sup>1</sup> I argue that the Nijepka, in contrast, understand mining risks well. The narrative that I presented in chapter 5 supports my position. Fisher found that 72% of gold miners (N=55) believed that gold mining was more dangerous than other jobs, 23% doubted this and 5% did not know. Only 36% of gold miners said they found gold every month, while 62% said they was not for sure. Further, 66% of Nijepka believed that participation in gold mining increased the chances of getting malaria (N=142), 36% doubted that, and 4% did not know. Based on these results and my experiences in Senegams, I argue that Nijepka miners are typically well aware of mining risks.

### Econometric Model

I use one-to-bit regression to simultaneously test the risk and the poverty hypotheses. The dependent variable is the number of years that a person has been mining for gold. The logic is that the longer an individual mines, the greater the risks to his or her health and economic stability. The time measure differs from a measure of present involvement in mining in that it allows me to include people who are no longer mining.

today. In this way I decrease the bias that would result from the most successful women leaving the mining industry. I include the dependent variable as the log of the number of years spent in mining. The coefficients in table 7-4 represent the percentage change in the time spent in mining due to one unit change in the explanatory variable, when all other explanatory variables are held constant.

Explanatory variables include a measure of risk tolerance, education of access to formal and informal income, and a measure of economic dependence. The risk hypothesis is supported if I find that the duration of mining positively relates to risk tolerance and access to alternative income sources. The poverty hypothesis is supported if I find that the most persistent miners are people with the least income alternatives who have many dependents. I control for sex and age. Sex is expressed as a binary coded female that has the value of one if the person is a woman, and the value of zero if the person is a man. Age is a continuous variable.

My approach differs from most anthropological studies on risk by using a quantitative model to test ethnographic findings and existing theories. The approach allows me to estimate the relative importance of selected individual and contextual sources for mining that were not captured by qualitative interviews. Other than most econometric models, my model integrates material indicators with a measure of personal attitudes. In doing so I hope to offer a more holistic representation of the forces that drive human behavior, which are likely a combination of material and ideological forces.

In the next section I operationalize the explanatory variables. I separately discuss self-rated risk tolerance, access to formal income, access to informal sources of income, and economic dependence. Definitions and summary statistics of the variables appear in



Tables 1-2 and 1-3 I evaluate econometric problems and their treatment in the following section.

## Explanatory Variables

### Risk Tolerance

I used a Likert scale to measure attitudes towards physical risk. A Likert scale is a list of statements to which interview participants express their opinion: agree-disagree, agree-disagree or favor-oppose (Bernard, 1993, 287-302). Typically seven-point (five-point or three-point) scales are used. I used a three-point scale with 20 statements about activities that are familiar to the Ndyako and perceived as hazardous. A typical statement would be 'I am afraid to cross the bridge by canoe'. The Likert scale measures attitudes towards risks rather than actual behavior. Appendix D section D-1 contains a description of the Likert scale that was administered. After collecting the responses, I recoded statements in the scale in such a manner that a positive answer on any question indicated a risk tolerant attitude and a negative answer indicated risk aversion. Tests of validity and reliability of the scale are discussed in Appendix E. The corrected scale contains 7 items and is internally reliable (Cronbach's alpha = 0.87).

Interviewees received a risk attitude score based on their responses to the statements. I calculated these scores as follows: I assigned a numeric value to each answer possibility (agree=1, disagree=0, neutral=0.5) so that the set of statements can be perceived as a risk test on which different people score differently. Someone who

answered more risk tolerant to the 5 items in the scale, scored a 1 for each statement. I calculated the average risk tolerance (RT) -score of each person as

$$RT = \frac{\text{Sum of the answer scores}}{\text{Total number of responses}} * 100\%$$

This formula allowed me to include cases with a missing answer. The answer-scores range from 0% to 100%, and indicate whether someone is most risk tolerant (high score) or risk averse (low score). A maximum risk-tolerant would score 3 points divided by the 3 questions he or she answered, ending up with a total score of 100% on the risk tolerance scale. Literature analysis suggests that gold miners are more risk tolerant than others: the average gold miner (RT=73%) scored significantly higher on the risk tolerance scale than the average non-miner (RT=63%) ( $p < 0.001$ ,  $p < 0.001$ ).

#### **Access to the Formal Labor Market**

I measure access to the formal labor market by literacy, previous wage labor experience, and government employment. Literacy is expressed as the person's ability to read and write in Dutch. Previous wage labor experience is measured as the number of years that a person has worked in wage labor. I observed that several miners were government-employees suggesting that the flexibility of government jobs permits temporary engagement in gold mining. The receipt of public wages is included as a binary variable that has the value of one if the person is employed by the government.

#### **Access to Informal Income**

For those with little access to the formal labor market, informal jobs offer an alternative. The Nijuka are typically involved in multiple informal jobs, including logging, making livestock, agriculture and even transport. I generated a binary variable that has the value of one if the person earned income from any one of these informal

season in the year before the interview. Another informal way to deal with economic distress is to borrow or receive gifts from friends and family. I include loans as a binary variable that has the value of one if the person reported that he or she was able to receive loans. The variable loans does not measure whether the person actually received loans, but whether the person believed that he or she could get a loan if needed. I included remittances as a binary variable that has the value of one if the person had received remittances from family abroad during the year before the interview.

### **Economic Dependence**

People need more money when they have more economic dependents. I assume that people have more economic dependents when they have more children but fewer household members to help out financially. I measure economic dependency by the ratio of the number of children of the person, to the number of adults in the household.

### **Econometric Specification**

I tested and corrected for heteroskedasticity, endogeneity, and multicollinearity. The Cook-Weisberg test indicated that the assumption of constant variance of error terms could not be rejected ( $\chi^2=1.08$ ,  $p<\chi^2$  of .30). Access to loans may be endogenous because credit arrangements are most common in the mining area than elsewhere among the Pijpda. I keep this variable in the model because it is important to test the hypothesis. One could argue that the receipt of alternative income from informal labor or the government is endogenous because being a gold miner may prevent a person from exploring other job options. However, as my respondent Marcos was not less likely to

engage in alternative labor just because they are gold mining, the average gold miner mined for less than seven months per year (Std. 93, Meanrob 5.33SD=3.6) which leaves much time for engaging in other jobs.

I tested for multicollinearity and excluded educational measures that strongly correlated with literacy, such as education ( $r=0.79$ ) and Dutch language skills (rob 93). I found a strong negative correlation between being female and risk tolerance ( $r=-0.61$ ), indicating that women in the sample were on average more risk averse than men. Despite multicollinearity I left risk tolerance in the model because the variable is important for testing the risk hypothesis. When I run the model as an ordinary least squared regression I found small differences in the estimated causal effect and statistical power of the coefficients, but not in their direction. I decided not to use the more common-ordinary least squared regression because the robust model better represents a functional form with many zero-values for people who have never been gold mining.

## Results

The regression results for the model that predicts the duration of gold mining as a function of risk tolerance and economic indicators of risk and poverty management appear in table 7-4. Only the receipt of government income and the ratio of children to adults in the household are significant at the 95% confidence level. Government employees are estimated to spend 174% less time in mining than others ( $p=4.54$ ,  $p<0.001$ ). Having more children and less adults in the household increases the duration of mining. People with twice as many children as adults in the household are estimated

to mine 10% more years than people with equal numbers of children and adults ( $\beta=2.39$ ,  $p=0.00$ ).

The remaining results are statistically weak. But, education has a negligible causal effect; the coefficient ( $\beta=0.002$ ) suggests that even a 100% difference in risk attitude between the least risk averse and the most risk tolerant would increase the duration of mining by only 0.2% ( $\beta=0.00$ ,  $p=0.33$ ). Informants of success in the formal labor market are negatively associated with working in mining. Less successful people are estimated to spend 1% less time in mining than otherwise ( $\beta=-0.01$ ,  $p=0.00$ ), and wage labor experience decreases the number of years in mining by 1.2% ( $\beta=-0.01$ ,  $p=0.43$ ). People who were miners from informal labor or subsistence are estimated to spend respectively 4% ( $\beta=0.13$ ,  $p=0.03$ ) and 1.2% ( $\beta=0.037$ ,  $p=0.71$ ) less time in mining. Access to loans is supposed to increase the number of mining years by 1.1% ( $\beta=0.00$ ,  $p=0.32$ ).

### Discussion

The risk hypothesis motivates why people will work longer in gold mining if they are more tolerant of physical risks and have better access to back up resources. The results had not to reject this hypothesis. Even though bivariate analysis suggested a significant positive relation between gold mining and risk tolerance, I found no proof of such a relation after controlling for gender. Not one miner mentioned entering mining with the expectation to become rich. One miner responded to my inquiry if mining provided good chances of getting rich: "I do not know any rich gold miners. When I get rich then I will leave." I found no evidence for the suggested expectations of mining, however that

others have reported (MacMillan 1995). Rather, Nijala gold miners assumed the economic prospect of mining as a viable pathway.

Economic security tends to discourage rather than encourage gold mining. The effect directions of the coefficients suggest that people who have access to formal labor or receive income from informal labor or remittances use less frequent miners. Only access to loans had a positive sign, but this variable is highly endogenous. Several miners mentioned to continue mining until they would have enough money to leave mining and begin something else. The economic vulnerability of miners also appeared from their limited resistance to shocks. I frequently observed that small misfortunes such as an excess of rain, ill laborers, or broken equipment caused bankruptcy of the miner's owner. From these arguments and observations, I conclude that long-term miners are generally people who have little economic security.

The poverty hypothesis stated that Nijala will work longer as gold mining if they have more economic dependents and less access to income alternatives. The data fit the poverty hypothesis better than the risk hypothesis, but few results are statistically significant. I draw on ethnographic data to verify, control, and explain what is suggested by the statistics.

People become gold miners partly because they are the primary economic providers for their families. People with more children to support and less adult household members that could offer economic assistance, mine a significantly longer time people with less economic dependents. Ethnographic data verify the economic responsibility of miners towards their families. In chapters 4 and 5 I presented several Nijala narratives that expressed the concerns of miners about their children and their

children's education. A female camp-based DPO in Sella Creek explained how gold mining allows her to give her children a good education.

I am always busy *hoanggg*, I cannot sit down. First I was selling, and I used my profits to buy a suitcase in Singapore, which cost a million guilder (approximately 1,500 US-dollar). Four of my children go to school, one goes to the Havo [higher level high school], and another one to the Mulo [medium level high school]. Only one daughter is here. I pay for school with the gold mining income. I want my children to complete their education, then they can go somewhere else. In the early days you received child benefits, now you have to try everything you can.

Gold miners typically reported not only supporting their nuclear household. Many miners supported their mother, father, brothers, and sisters, or gave them pocket money. Because men are traditionally responsible for the family cash income, they make on average significantly more than their wives/household members.

The results suggest that people with access to alternative income do not become gold miners. Only government employment is marginally significant, and seems a strong incentive to not participate in gold mining. Doss (28) acknowledges that the benefits of a formal job are that 'you are covered medically, and you receive *ADP*' [Aparat Dikawatirana Wacutaning, an old age pension]. However, he does not have a wage labor job because 'the city-system does not allow me to stay and work in the city in a company, because you have not finished your education, you work below your capacities'.

The link to education in the above fragment appears in the narratives of many gold miners. Another miner confirmed that 'because I have not studied more, [mining] gives me the best income'. The negative link between education and mining was not significant in the quantitative analysis. A possible explanation is that because many Nijaks are illiterate, literacy does not distinguish miners from non-miners within the

ethnic group. Because the literacy rates of the Mijikenda are much lower than the national average (chapter two), literacy may decrease the labor options of Mijikenda at a national level. Qualitative data that I presented in chapter 3 support this argument.

The remaining relationship of income to income are also statistically weak, but the directions of their effects agree with the poverty hypothesis. Wage labor experience and the receipt of remittances seem to discourage mining. Gold miners also appear less likely than others to earn income from informal activities other than mining, including agriculture, transport, trading, and livestock. In conversations, Mijikenda miners mentioned that they did not have the capital to begin an informal business as a taxi driver, business, or shop owner. Mining is viewed as a temporary solution that allows one to save to start up something else.

Summarily, information obtained from the few significant results, the effect direction of the remaining results, and qualitative observations, suggests that the poverty hypothesis fits the data better than the risk hypothesis. Risky behavior among the Mijikenda seems to be the outcome of poverty and marginality. Some studies support my argument. In Bolivia, Sandoval (1997) finds that poor peasants opt for an economically and politically risky crop such as coca when alternative income sources are inaccessible or pay too little. Mining researchers have likewise concluded that gold mining is a rational alternative when other livelihood options decline (Nugent 1993; Roopnarayan 1994). My findings confirm the explanation of MacMillan (1997:71) about why small holders go mining:

[It is a] false impression that they mine because they are desperate and that is the only livelihood available to them. ... Only a small fraction of professional managers depend entirely upon that form of employment for a living. Everybody else is the pit is there to supplement their other forms of income.



The point here is that domestication forces may play less of a role here than is often believed, and for this reason reducing poverty will not necessarily be reflected in smaller numbers of *ganyu* workers. ... No doubt migration to the *ganyu* will continue as long as mining offers the best possibility to make a cash (Held, 76).

According to MacMillan, small farmers go mining to earn extra, rather than out of necessity. In contrast, my research suggests that even though few people mine year-round, Nijoka become gold miners when they do not have access to other employment that secures family survival. In contrast to what MacMillan argues, I believe that poverty relief and improved job availability will decrease the number of Nijoka gold miners.

## Conclusions

I draw two conclusions from the quantitative and qualitative findings. First, the conclusion that mining is not preferentially endorsed by risk-tolerant groups negates stereotypes of gold miners as adventurous gamblers hired out. Second, gold mining is more attractive to people who are economically worse, rather than best, suited. People seem to tolerate mining risks when they have many economic dependents and few backup resources. Several policy domains appear from these conclusions. An understanding that gold mining is a last resort rather than an adventure may be a first step toward more effectively communication of policy makers with miners. The analysis further suggests that public policy that improves the access of Nijoka to employment, for example through education or the creation of public jobs, may discourage mining. The remaining research in risk research invites future research on the general patterns that underlie risky behavior among the poor.

Table 3-1. Physical and economic risks of different street jobs, why living with others than the street risks such as malaria

Job	Economic risk	Physical and Social risk	Male or Female?
Camp-thief	instability in pay investment and opportunity exposure, homelessness	higher chance of being a victim of violent crime or robbery	both
Perimeter	the risk of not earning an income versus the security of receiving food and shelter	work conditions that cause the loss of fingers or life; back pain from heavy work	M
Cook	low risk, usually receives a fixed wage	back problems, burns, female cooks confront sexual harassment	both
Merchante	not being paid for goods sold on credit	back problems from carrying heavy loads	both
Sex worker	not being paid for delivered services	sexual harassment or exploitation, contracting sexually transmitted diseases, community disapproval	F
Carrier	low, except when services are paid on credit	back problems from carrying heavy loads	M

Table T-1. Definitions of the dependent, explanatory, and control variables

Variable	Definition
<b>Dependent</b>	
LogYears in gold mining	Log value of the total number of years the person has been gold mining
<b>Explanatory</b>	
Risk tolerance	Likert scale of risk tolerance, ranging from most the risk averse (0) to the most risk tolerant (100)
Public wages	Binary of receiving public wages. 1= The person is employed by the government, 0=The person is not employed by the government
Remittances	Binary of receiving remittances. 1= The person receives remittances, 0=The person does not receive remittances
Loans	Binary of access to loans. 1=The person is able to borrow, 0= The person is not able to borrow
Literacy	Binary of ability to read and write in Dutch. 1=The person is literate, 0=The person is illiterate
Wage labor experience	Number of years experience in wage labor, in years
Alternative informal jobs	Binary of whether the person receives income from any or all of the following sources: <u>hauling</u> , <u>brickwork</u> , <u>agriculture</u> , or <u>transport</u> . 1=The person receives income from at least one of these sources, 0=The person receives income from none of these sources
Kids-at-home-adoles	The value of the number of children of the person, by the number of adult workers in the household
<b>Control</b>	
Female	Binary of sex. 1=Female, 0=Male
Age	Age of person in years

Table T-2. Summary statistics

Variables	N	Mean	Std. dev.	Range
Years in gold mining	219	5.64	7.64	0-36
Risk tolerance	201	38.37	41.97	0-100
Public wages	217	0.09	0.29	0-1
Remittances	219	0.16	0.38	0-1
Loans	219	0.37	0.49	0-1
Literacy	219	.89	0.39	0-1
Wage labor experience	218	1.6	4.17	0-37
Alternative informal jobs	219	0.75	0.43	0-1
Kids-at-home-adoles	214	1.93	1.66	0-13
Female	219	0.42	0.49	0-1
Age	219	36	13	16-70

Table 7.4 Regression results for the least model predicting the duration of money

Variables	$\beta$	s.e.
Bank tolerance	0.001	0.001 (0.17)
Public wages***	-1.34	-1.36 (0.00)
Leisure	-0.00	-0.00 (0.00)
Wage labor engagement	-0.03	-0.03 (0.17)
Unearned income	-0.04	-0.14 (0.03)
Lease	0.10	0.09 (0.12)
Regulation	-0.05	-0.07 (0.11)
State dividend rebate*	0.10	0.00 (0.04)
Formal***	-2.04	-0.00 (0.00)
Age	-0.000	-0.00 (0.07)
Constant***	1.09	4.34 (0.00)

Dependent: Log(Form to paid money)

\*  $p < 0.05$

\*\*\*  $p < 0.01$

#### Model information

Number of left-censored observations in Log(Form to paid money)=0, 127 uncensored observations

Log Likelihood = -225.38

$\chi^2$  ( $df = 8$ ) = 147.41 ( $p < 0.001$ )

Pseudo  $R^2$  = 0.7263

## CHAPTER 8 CONCLUSIONS

Why do some people become small-scale gold miners, while others do not? I could conclude this discussion by stating that mining is most attractive to poor men who have many dependents and few job options. Such an answer, however, does not capture the wide variation in responses to the gold rush in Suriname. It does not explain why poor and marginal men of other ethnic groups are not mining, why some poor Ndjuka choose to not be gold miners, and why women minimally participate in mining. Nor does it clarify why, despite poverty's historical presence, large numbers of Ndjuka have entered mining only during the past two decades. In this work I explained much of the variation in local responses to the Suriname gold rush.

In chapter one I made several predictions about the distinct and approximate factors that encourage the participation of Ndjuka in small-scale gold mining (figure 1-1). I integrated diverse qualitative and quantitative methods to study these predictions (table 3-1). At the international level I predicted that the mining population would grow in response to rising gold prices and stable real-mining prices of oil. Within Suriname I tested for the influence of political and economic instability. At the local level I first analyzed the criteria that Ndjuka individuals considered when making decisions about gold mining. I used their responses to construct an ethnographic decision tree model. The decision model suggested that gender and risk-differentiated personal decisions about mining

Informed by qualitative findings and field observations, I hypothesized that women are less likely to be gold miners due to their reduced access to money, mobility, and social networks, and their responsibility for children. Furthermore, because small-scale gold mining is economically and physically risky, I predicted that most likely to participate in mining are risk-tolerant individuals who are best equipped to mitigate mining risks. A competing hypothesis stated that mining is the choice of people with many economic dependents and few back-up resources.

I supported some hypotheses, rejected others, and nuanced mechanisms along other predictions. Here I conclude with a model that integrates the findings from previous chapters (Figure 3-7). Figure 3-7 organizes the drivers of small-scale gold mining in Suriname from larger to smaller levels of social organization. Represented by the continuous arrows, the model highlights the supported links between causal factors and small-scale gold mining. I provided either empirical or ethnographic evidence for these links. The dashed arrows indicate relations that likely exist, but for which the evidence is weakly due to data paucity or statistical uncertainty. Relations that I rejected do not appear in the model.

### **Driving Forces of Small-Scale Gold Mining in Suriname**

Nijaka small-scale gold miners respond to environmental pressures at the macro, intermediate, and small scale. Macro-scale analysis suggests that fluctuations in the global economy do not influence Nijaka miners. The data only allowed for time-series analysis over a thirty-year time span, and its statistical power was weak. Nevertheless, I can reject the existence of a positive relationship between gold prices and participation in

gold-mining, increasing numbers of Ndjuka became miners while gold prices were falling. Neither did rising oil prices discourage people from entering mining. Qualitative data suggest that Serenian migrants moved undeterred and stimulated the growth of the Serenian small scale-mining industry. The absence of accurate documentation of the magnitude of *ganggangs* prevented the analysis of its relative importance with quantitative methods.

Economic changes within Sarima have been more important than international economic changes in stimulating the local participation in gold mining since the 1980s. Many Ndjuka took up mining in response to inflation and unemployment. The effect of political instability – which escalated during the interior war (1986-1993), remained ambiguous. Even though political stability had high statistical power, interviews suggest that the interior war and its aftermath left the Ndjuka as a marginal ethnic group in Sarima, decreased their subsistence options, and discouraged gold mining. A significant structural break in the regression model before and after the onset of the interior war supports the qualitative data.

When asked about their reasons for gold mining, Ndjuka miners mention that there are no jobs other than gold mining, that available jobs pay insufficiently, and that they lack the educational skills necessary for better work. Miners also refer to discrimination in the city and prefer mining for its freedom from city houses. Poor urban dwellers of other ethnic groups are less inclined to enter mining because they are typically unfamiliar with life in the forest, andaverse to working there.

All Ndjuka are members of a poor and marginal ethnic group, but not all are equally likely or willing to become gold miners. Within the household and community,

greater influence the chance of an individual to either enter or avoid the small-scale mining industry. Among the Nijaka there is a strong cultural expectation for men to financially sustain their families. For many men small-scale gold mining is the only job that allows them to meet that expectation. Meanwhile no local barriers exist to dissuade men from becoming miners.

Women are more restricted in their subsistence options than are men. The larger involvement of women in subsistence, coupled with their reduced access to money, limits the access of women to mining. Contrary to expectations, I did not find empirical evidence that limited mobility and socialization deep women access to mining. A provocative finding is that men with equal income, mobility, time spent on subsistence and socialization, women are significantly less likely than men to become miners.

Ethnography provides several plausible explanations for the gender bias in mining. In Nijaka culture it is respectable for men, but not for women, to mine or otherwise earn an independent income far from the home. Women reported to avoid mining out of fear of community or spousal sanctions, which may stigmatize and isolate women who break with expected gender roles. Further, women may less frequently participate in mining in part because individual subsists completely working in the mining area. The comments of some women also suggested that they preferred staying in their communities rather than exposing themselves to the harsh conditions in the mining camps.

It follows from the above that Nijaka men are more likely to pursue mining rather than another job, while the opposite is true of Nijaka women. However, there are exceptions to this pattern, some of which were explained in the decision model. Non-



mining, men tend to justify their choice by previously disappointing experiences in mining and by physical weakness due to illness or old age. Female miners were either the economic providers of their families or had joined from mining backlands. Qualitative analysis of the differences between mining and non-mining women suggested that single motherhood, urban residency, and previous engagement in marketing activities, allowed women to overcome gender barriers to entering mining. Evacuated women, like men, usually only became gold miners because they saw no economic alternatives.

I concluded the analysis with an investigation of risk. Because small-scale gold mining entails many physical and economic risks, it is likely that miners and non-miners perceive and manage risk differently. Acknowledging the limited statistical power of the statistical analysis, I could draw several tentative conclusions. First, I reject the stereotype of gold miners as adventure risk-takers. Second, it is unlikely that mining is the choice of Népuka who have most back-up resources. Rather it seems that Népuka who have many economic dependents and few income options tolerate the economic and health hazards of small-scale gold mining for the sake of family economic survival.

### Lessons Learned

Through the analysis of the forces that drive off small-scale gold mining in Suriname, I touched upon larger questions of why people choose hazardous, uncertain, and ecologically damaging subsistence strategies. Illusions, poverty, and inequality are systemic forces that characterize both the mining environment in Suriname and other extractable land use in Latin America (Arias, Fox, and Yellaguet 1996; Foster and

(Durham 1998; Spradell, Bailey and Headland 1998; Schenck and Wood 1992; Stanish 1993; Stanish and DeWalt 1996). Yet as contrasts to other Amazon countries, forest degradation in Suriname is not caused by population pressure, land scarcity, over-hunting, or national education policies (Jelinek 1993; Sauters 1993; Schenck and Wood 1992, 1993; Wood et al. 1996). I agree with other researchers that gold miners are typically poor, poorly educated, and not competitive in local and national job markets (Cheney 1982; MacKillop 1993; Haughton 1993; Roopnarain 1994). However, I question other existing explanations for mining, including the importance of gold prices and an adventurous character. A recurring theme in my and other studies is that poverty coupled with the absence of traditional job options encourages ecologically damaging resource use.

My research addresses several methodological and theoretical gaps in existing anthropological research. First, my research is innovative in integrating quantitative with qualitative methods, and personal narratives with generalizing models. Blending expertise by both statisticians and postmodern anthropologists, I hope to have shown that the integration of methods produces more informative and interesting arguments than either method in isolation. Second, risk research among resource producers has primarily focused on peasants. To my knowledge I provide the first attempt to differentiate the risk attitudes of, and risks faced by, male and female miners and neo-miners. Third, few researchers explore why women might not enter mining in countries similar to mine. My research may be the first to explore in detail how gender inequality within the household and community limits the access of women to gold mining.



Figure 8-1 Driving forces of small-scale gold mining among the Ndjuka Mazono

The model organizes and links the drivers of small-scale gold mining in Suriname from the international level (at the top) to smaller levels of social organization (below). The arrows in the model indicate the direction of the relationships between processes at different levels of social organization and gold mining. The dotted arrows suggest links that likely exist, but for which no conclusive evidence could be presented.

## APPENDIX A SUMMARY IN DUTCH

Waarom werken mensen zo mensen in de kleinschalige productie van maïs, door iedereen dat niet? Deze vraag staat centraal in dit proefschrift, en is gerelateerd aan het theoretische vraagstuk waarom mensen kiezen voor een individueel of ecologisch levenswijze. Wetenschappers hebben zich voornamelijk afgesproken over de negatieve consequenties van de kleinschalige productie, voor de opbrengste productiviteit, het milieu, en voor de sociale relaties in plaatsen waar productie plaats vindt. Daarnaast reflecteert de keuze van een productie systeem, en het menselijke proces hangt al dus niet deel is nemen. In het algemeen blijkt de productie van maïs van de mens, verbleven, en laag productieve. Het blijft echter een raadsel waarom onder in bepaalde cultureel-cultureel en economisch milieu, sommige mensen ervoor kiezen productie te worden en anderen niet.

### Onderzoekspost

Antropologisch veldwerk bij de Nijuka boerengroepen in Suriname naar de keuze van deze studie. De boerengroepen zijn afkomstig van verschillende Afrikanen die de traditionele gemeenschappen stichtten in het regnerwoud. Men schat dat er ongeveer 30.000 boerengroepen in Suriname wonen, verdeeld over een groot deel van het land en vooral cultureel vrij-uitgevoerd zijn. Van alle etnische groepen in Suriname vormen de boerengroepen het grootste deel van de productie. Het omgave 25.000 leden vormen de Nijuka als van de grootste boerengroepen. Zij leven voornamelijk in Oost-Suriname en Elmina Guyana langs de Marowijne en de Tapanahony rivieren, in het Caribbeë gebied en langs de Rijn Kreek. De Nijuka werken meer in de productie van maïs dan andere boerengroepen. In overeenstemming met de productie voor de exploitatie groei in de Surinaamse productie wordt de jaren naakt, en voor de productie van individuele Nijuka de verhalen in het tijd, seizoen, tijd, en andere landbouwactiviteiten.

### Methoden

Veldwerk werd verricht in productieactiviteiten, in Nijuka dorpen in het bosland en in de hoofdland (Plantation). De studie werd voornamelijk uitgevoerd in de productieactiviteiten op de Rijn Kreek en in de dorpen Drentelbetsje en Indonitje. Interviews werden afgenomen met mensen op vrijwel alle plaatsen, productieactiviteiten en andere boerengroepen. De definitie van productie van maïs die zich in het productieactiviteit gebied en een individueel productie in de productie of andere productieactiviteiten. Het is de productie en productieactiviteit naar deze definitie met de lokale productie, individueel, dorpen en andere. De naam definitie werd verkregen omdat individueel vaak worden van laag- of individueel individueel individueel individueel. Het is de laag- of individueel individueel individueel individueel.

een week later als deuren werken. Kampakke (20/4) wilten hun anticoncepcie ook een door voodagewoonten en gebruiken te verbeteren. Onder een beperkte definitie van de classificatie van deze personen onbetrouwbaar. Verder was de belangrijke bestemming van weten af te zij af dan niet in Balla Kwek gingen werken en op de tweede plaats kwam de keuze voor het type werk.

Onderzoeksmethoden omvatten zowel kwalitatieve en kwantitatieve methoden voor data verzameling en analyse, en zijn opgesteld in tabel 3-2. Ik koos voor een brede methodologische aanpak om verschillende redenen. In dit artikel richtte onderzoekscritici in het verleden welke methoden het beste resultaten zullen opleveren. Verder hoop ik ook te weten dat de aanpak van antropologen statistiek, en kwalitatieve en kwantitatieve methoden, een voldoende breed scala oplevert dat een van deze methoden goed is de derde plaats geloof ik dat de antropologie heeft heeft bij experimenten met nieuwe manieren van onderzoek en data-analyse.

### Voorstellingen

Ik veronderstelde dat verschillende factoren de exploratieve denken van de groeiende lokale vermarkting (figuur 1-1). Ik veronderstelde dat het aantal Nijalea groedecultoren zou toenemen ten gevolge van stijgende internationale marktprijzen voor goud en andere wereldwijde producten. In navolging van betredingen in andere landen veronderstelde ik dat politieke en economische instabiliteit tussen Suriname en Colombia in de groeiende markt veroorzaakt. Op lokaal niveau werd gekozen voor goud en riet. Ik schreef dat de laatste drie jaar 15 tot 25 Nijalea groedecultoren een vrouw was. De groeiende markt van het Nijalea vermarkten werden veroorzaakt van participatie in de groeiende markt voor het gebruik van goud, riet, en andere producten, en hun verspreidbaarheid naar de landbouw. Ik zou willen en durven nemen het belangrijke om de lokale markt groedecultoren dagelijks geïnteresseerd worden met vele commerciële en groedecultoren's. De groeiende markt met de groeiende markt in vergelijking met andere markten voor riet's, goud, en andere alternatieve commerciële producten hebben een economische instabiliteit te comprimeren.

### Betredingen

#### Interactie en Nationale Factoren

Uit de exploratieve gegevens analyse in hoofdstuk 4 blijkt dat Nijalea groedecultoren met stappen op prijsveranderingen op de wereldmarkt. Slechts een periode van dertig jaar werd bekoren, en de meeste resultaten waren slechts gezien met riet. Er kan worden verondersteld dat, in tegenstelling tot met andere groedecultoren hebben bekend, er geen politieke crisis bestaat tussen groedecultoren en het aantal groedecultoren. Stijgende prijzen waren een reden van en voor. De migratie van Surinaamse groedecultoren lijkt belangrijk voor de groei en modernisering van de groedecultoren. Deze reden kan ook worden getest met kwantitatieve methoden vanwege het gebruik van data door de veelal digitale gegevens.

Op nationaal niveau hebben de groeiende markt en de stijgende werkloosheid in Suriname geleid tot de lokale markt voor het belangrijke markten van de groedecultoren te betreden. De Surinaamse bevolking waaronder de groeiende stijgende kosten voor levensonderhoud. Verdere gegevens vermarktingen tussen 1990 en 1997 en van nu.

1980 met 1990 naar consumptiegroei met 102%. Hoge inflatie maakt de goedertiening statistischelijk onduidelijk. Het vrouwenarbeidsaandeel neemt toe, en het huishouden, en de kleding van alle kinderen op zich neemt. Inflatie verlaagde ook de realverlof van de koopkracht van de werkenden in Panama. Hetzelfde geldt voor de goedertiening in van de meer stabiele wereldprijs. De invloed van politieke instabiliteit kan niet kwantitatief worden gemeten. Verhalen van vrouwen suggereren dat de kinderarbeid oorslag (1980-1990) de Nijlka heeft geprojecteerd tegen de Surinaamse maatschappij. Door de toenemende verspreiding van de economische instabiliteit, en vooral de instabiliteit van het huishouden zijn de huidige kansen van Nijlka op de arbeidsmarkt gecompromiteerd.

### **Lokaal Niveau: Betreft het Model**

In hoofdstuk 3 analyseren de de redenen die Nijlka individuen zelf geven voor participatie in de goedertiening. De verhalen die zijn geïnterviewd weergegeven in een etnografisch beschrijvend model (figuur 3-1). Het model raakt het gebruik van 10% van een nieuw groep Nijlka met. De Nijlka-Nijlka de economische belangen tegen de maatschappij van de goedertiening af te weigeren. Omdat op dit gebied een belangrijke rol spelen en vrouwen hebben verschillende rollen en behoeven te maken met verschillende maatschappij van de goedertiening.

Van vrouwen wordt verwacht dat zij het huishouden financieel onderhouden. Zij worden geacht te weten en te geven andere mensen zijn voor iemand met hun beperkte opleiding, omdat andere mensen niet voldoende betalen, en voor de economische rol van een huis in de stad. De enige redenen voor geen goedertiening te worden zijn schulden, ziekte, of een negatieve ervaring met de kinderen of de goedertieningsrelaties in de maatschappij. Vrouwen reizen naar het geïnterviewde gebied als zij een goedertiening als schuldgevoel hebben, of als zij economisch verantwoordelijk zijn voor hun familie in de stad. De kinderarbeid van vrouwen wordt beperkt door transport, de verantwoordelijkheid voor het huishouden en de kinderen, en het verlies van schuldgevoel.

### **Gedrag**

In hoofdstuk 4 wordt er een politiek ingrijpen model om de kansen die vrouwen werkende deel te nemen aan de goedertiening verder te onderzoeken. Uit de etnografische analyse blijkt dat vrouwen die de verhalen beperkt in hun bewegingsvrijheid door hun beperkte inkomen en hun grotere verantwoordelijkheid voor de kinderarbeid. In tegenstelling tot de verwachting wordt ik geen belang voor de invloed van beperkte mobiliteit en verplaatsing.

Verder wordt de rol van politiek ingrijpen, mobiliteit, verantwoordelijkheid en de tijdsbesteding van kinderarbeid, vrouwen van 10% meer kansen hebben om goedertiening te worden. Engelen heeft plausibele verklaringen voor de goede mogelijkheden die maatschappij met hen worden verlaagd. De Nijlka cultureel verantwoord van mannen dat zij verantwoordelijk inkomen verdienen voor hun baan, maar accepteren dit niet van vrouwen. Vrouwen verlaten dit zij de goedertiening vanwege andere zij bang waren voor de afwijking van de schuldgevoel in de gemeenschap. Omdat veel vrouwen afhankelijk zijn van de schuldgevoel en van verhalen met hun en familie, heeft vertelling door de gemeenschap voor acceptatie, gebruik, en voor consequenties voor een vrouw en hun kinderen. Het is ook waarschijnlijk dat maatschappelijke taboes vrouwen werkende een

in de gezondheidszorg te werken. Verder vertellen verschillende verhalen dat zij de voorkeur geven aan werk aan huis te werken om de gevolgen van het harde leven in de gezondheidszorg. Vrouwen die de gezondheidszorg doorkruisen, ervaren vaak afnemende steun van de stad die eromringt, hadden met kinderen. Het vooral en economisch meer complexe vrouwen participeren alleen in de gezondheidszorg als zij geen andere uitweg zien om in het welzijn van hun familie te voorzien.

### **Man's**

Het gezondheidszorg heeft nauw te maken met ziekte, maar ook andere relaties en connecties, de aanwezigheid van orisinalen en beweging met bepaalde ziekte zoals malaria. Verder zijn er benoemde specifieke man's, en verschillen de man's van mannen en vrouwen (tabel 7-1). Mijnerwensen kijken over reguleren, zijn het slachtoffer van ongelukken, en verdienen een sterker percentage van de opbrengst. Scherwensen hebben een grote kans op schadelijke met seksueel overdraagbare ziekten. Het als mannen die vaak op kindert bruiden worden, zoals waken, klagen en slapen, lopen zij het risico van leed om te worden voor geleverde gestolen of sterven. Verder lopen vrouwen meer risico's van seksuele intimidatie en het verbergen van een lichaamsgevoelens.

Gezien het risico aan economische en fysieke risico's voornamelijk uit in landbouw. Het gezondheidszorg meer naar accepteren dan anders, en beter wijzen naar een economische opbrengst op te krijgen. De nalatigheid worden geacht met een klein negatief model. De veelal statistische ziekte resultaten worden uitgevuld met kwalitatieve observaties. De negatieve stereotypen van gezondheidszorg als vrouwen en kinderen wordt veroorzaakt. Gezondheidszorg met meer of minder risico in accepteren dan andere Mijner, en in tegenstelling tot het andere onderzoekers stellen voor dat geen bewijs voor overlevens verwachtingen van kinderen in de gezondheidszorg. Het lijkt ook waarschijnlijk dat gezondheidszorg degenen waren met de beste economische omstandigheden mogelijkheden. Daarnaast vindt dat die personen met meer mensen die van het economisch afhankelijk zijn en minimale toegang tot de arbeidsmarkt de risico's in de gezondheidszorg veroorzaken voor het welzijn van de familie.

## **Levens en Gezondheidszorg**

De analyse van de gezondheidszorg in Kameroen draagt bij aan algemeen kennis overlevende waarden mensen kunnen voor een persoonlijk, sociaal, en ecologisch duurzaam bestaan. Een uitdagend thema in de werk en andere studies is het vermogen van de gezondheidszorg om de gezondheid van individuen te verbeteren, de kans op duurzame gebruik van natuurlijke hulpbronnen, en het welzijn van verschillende duurzame bestaan op. Er is weinig onderzoek waarden vrouwen en mannen met gezondheidszorg relaties aan de gezondheidszorg. Mijn onderzoek legt en verklaart de betekenis van gezondheidszorg in het landbouw en in de toegang tot de gezondheidszorg. Ten tweede, onderzoek naar gezondheidszorg heeft ook voornamelijk bezig geboden met lichaamsgevoelens. Het mijn weten is dat de eerste studie dat de risico's van de benoemde gezondheidszorg relaties, en een verschillende ziekte met een overlevende waarden gezondheidszorg en een persoonlijk controle groep.

# APPENDIX B LIST OF DEFINITIONS OF RELEVANT AND FOREIGN WORDS

The list below contains definitions of foreign words and other terms relevant to the dissertation. The meaning of concepts in this dissertation may or may not be the same as their meaning in other works. The words are organized in alphabetical order.

Word	Definition/Translation
Apodewari	Purple pulp from the brain of the Aana' palm ( <i>Euterpe schwaneri</i> ). Apodewari is popular among Maroons and Britishers, who eat it pure or add sugar or lemon juice to make curries ( <i>curryjale</i> ). The pulp is used to strengthen the blood.
Bawa	Assistant in the Maroon governing system, responsible for delivering messages, services for the higher authorities, and a participant in decision-making. Each marital clan has at least one bawa.
Beli (bawli)	Shining, egg-shaped, a circular metal pan with a pointed bottom, 40-60 cm in diameter.
Bela	Down river, Niyaka settlements have traditionally been divided into those living upriver and those living down river. Bela refers to the territory along the upper Tapacheway river, north-for down river) of its confluence with the Luma river.
Budamawari	Unmarried person
Garipagari	Swahili word for small-scale or informal gold mining; the garipagari is the mining site and garipagagari refers to the activity of mining. In Swahili the term garipagari refers to throughout miners.
Gold miner	In this study a gold miner is anyone who is present at the mining site and is part of the mining industry or of the surrounding mine or economy.
Grooman or Grooman (Niyaka)	Household chief. Each Maroon group in Swahili has its own grooman who is the head of the group's political hierarchy. All important decisions affecting Niyaka life are taken collectively by the grooman, other local authorities, male elders, and usually some select women.



<b>Bouadian</b>	Informal trade of goods and services (verb)
<b>Kaptein, or Kaboon (Májuks)</b>	Headman. Each matrilineal clan has at least one kaptein who governs the village in terms of the <i>gratamas</i> .
<b>Kisa</b>	Religious taboo, often ordered by ancestral spirits and place specific. Examples of kisa are menstrual taboos, taboos on stream, and taboos on working on a specific day of the week (often Saturday or Sunday).
<b>Kwaka</b>	Cassava product, is known known as <i>gagika</i> . Women make kwaka by grating cassava root and pressing the pulp, creating a craggy cassava crumb. Kwaka is a main staple among the Maroons, and popular for travel or work, as the flour becomes it does not decay.
<b>Leopons</b>	A long and narrow type of sluiceway, often used in manual or low mechanical operations that use water.
<b>Maroons</b>	Descendants of escaped slaves who established independent communities throughout the Amazon. Surinamese Maroon communities have maintained a large degree of cultural and political autonomy. Surinamese Maroons refer to themselves as <i>Bosnegrijs</i> or <i>Bosnegers</i> .
<b>Májuks</b>	The Májuks are one of the six Maroon groups in Suriname, and refer to themselves as <i>Májuks</i> . The name <i>Chamali</i> (in Dutch: <i>Aankomers</i> ) is also used. In the literature the Májuks are known as <i>Djajaks</i> or <i>Tjogakel</i> , and <i>Aankomers</i> or <i>Aankomers</i> .
<b>Opo</b>	Upper: <i>Nájuks</i> matrilineages have traditionally been divided as those living upstream and those living down river. <i>Opo</i> refers to the territory along the upper Tapanahony river, south of its confluence with the Lawa river.
<b>Opa (tribal)</b>	Clan/tribal power that is available to people. <i>Opa</i> can be changed with ritual power and earned along is <i>awakara</i> . On other occasions the concept is used for avoiding spirits.
<b>Pang</b>	Piece of cloth, worn as a skirt, apron, cape, or waist kerchief. As girls approach adolescence, they exchange the waist-strap of infancy for a <i>pang</i> . A <i>pang</i> girl is a girl that has completed infancy.
<b>Portokiers (Portocokers)</b>	Term used throughout the Guianas to name small-scale, informal, gold miners. City residents still overrepresented in Suriname use the name <i>portokiers</i> , often negatively, but the gold miners themselves do not.

Shuigeshan	Mining equipment consisting of two or three flat wooden boxes, each a length of 2.5-3.5 m, and a width of 15-400 cm. (See also Appendix C) When gold-bearing material flows through the sluiches, gold particles are trapped in the boxes
Small-scale gold mining	gold mining that is characterized by: -Informality, large degree of independence of local, legal, and economic regulations implemented by the national government, and -A labor force that is not formally trained in mining and has a low educational background in general



## APPENDIX D SURVEY PROTOCOL

### **I. Personal Data**

1. Name
2. Age in years
3. Place of birth (open ended)
4. Place of residency (open ended)
5. Sex (0=Female, 1=Male)
6. Head of household (0=No, 1=Yes)
7. Occupation (open ended)
8. Nationality (1=Guinean, 2=Dutch, 3=French, 4=other)
9. Years of formal education
10. Literacy (0=Illiterate, 1=Literate)
11. Ability to write name (0=No, 1=Yes)
12. Ability to read time (0=No, 1=Yes)
13. Languages spoken (1=Nijaka, 2=French, 3=Dutch, 4=Portuguese, 5=English, 6=French, 7=Other)
14. Father's maximum education in years
15. Mother's maximum education in years
16. Clinic affiliation (1=Nijaka, 2=Serresma, 3=Abia, 4=Parassama, 5=Matrua, 6=Kureu)

### **II. Household Composition, Foraging of Resources and Labor**

1. Number of legal or common law partners
2. Number of children
3. Number of household residents
4. In addition to your primary job, what additional work do you do to sustain yourself? (open ended)
5. If you earn money or produce food, do you share with your partner? (No=0, Yes=1)
6. What/how much do you give? (open ended)
7. If you earn money or produce food, do you share with your extended family? (No=0, Yes=1)
8. What/how much do you give? (open ended)
9. With whom do you share most? (open ended)
10. Does your husband/wife share with you? (No=0, Yes=1)
11. What/how much does he/she give you? (open ended)
12. Does your extended family share with you? (No=0, Yes=1)
13. What/how much do they give you? (open ended)
14. Who would you ask for a loan? (open ended)

13. 'What would you ask for help with work?' (open ended)

*Min only*

14. Did you clear forest for a subsistence ground for you this year? (No=0, Yes=1)

15. Did you clear forest for a subsistence ground for someone else this year? (No=0, Yes=1)

16. For whom? (open ended)

*Pluses only*

14. Did your husband clear forest for a subsistence ground for you this year? (No=0, Yes=1)

15. Did someone else clear forest for a subsistence ground for you this year? (No=0, Yes=1)

16. 'Who?' (open ended)

### III. Health

1. Have you been ill this year? (No=0, Yes=1) How long? (in weeks)

2. How many malaria have you had in your life?

3. Did your near family experience malaria this year? (No=0, Yes=1)

### IV. Assets, Income, Land

#### A. Assets

Do you own (0=No, 1=Yes)

- |                          |                                      |
|--------------------------|--------------------------------------|
| a. House in the interior | k. Capital equipment (e.g. chainsaw) |
| b. House in the city     | l. Gun                               |
| c. Paddle                | j. Golden jewelry                    |
| d. Camel                 | k. Radio/TV                          |
| e. Motorized canoe       | l. Mining camp                       |
| f. Golden teeth          | m. Women's medicine                  |
| g. Flashlight            | n. Mongoose netting                  |
|                          | o. Livestock (e.g. chickens, ducks)  |

#### B. Income

Do you receive income from any of the following sources? (0=No, 1=Yes)

- Ranching
- Agriculture
- Trade
- Transport
- Owning a mining machine
- Social services (e.g. pension, child transfer)
- Gift service
- Wage labor
- Gift money
- Livestock
- Gifts

3. What was your income over the past year (cash money or product-value)

4. How much income does your partner/parents/in-laws? (cash money or product-value)

3. Do you have wage labor experience? (0=No, 1=Yes)

4 a. If No: Why not? (open ended)

4 b. If Yes: When and for how long did you work/ have you worked in wage labor? (open ended)

7. How much did you earn in your wage labor job(s)? (in local currency)

#### 8C Land

1. Do you own land? (0=No, 1=Yes)

2. What kind of land? (a.g. agriculture, fallow, open ended)

3. How far away is your land? (in km walking by road)

#### 9. Labor Allocation

1. How often do you engage in

1= Never

3= A few times per year

5= Every week

2= Once a year

4= Every month

4= Every day

a. Cooking

g. Work with technical equipment

b. Childcare

h. Wood carving

c. Clearing land

i. Agriculture

d. Herding

j. Trade

e. Gathering

k. Wage labor

f. Fishing

l. Gold mining

2. How much time per year do you spend in Paramaribo? (in months)

3. How much time per year do you spend in Sella? (in months)

4. How much time per year does your husband/wife spend in Sella? (in months)

#### 9I Gold Mining as a Risky Activity

The Likert-scales below are coded in the following way

1=agree, 0.5 =neutral/both know, 0=disagree

Do you agree or disagree with, or feel neutral about, the following statements?

#### A. Risk perceptions

1. Participation in gold mining increases the chances of getting malaria

2. People fight more in the mining area than elsewhere.

3. Gold mining is more dangerous than other work

4. As a gold miner, you find gold every month

5. There is as much malaria in the villages as there is in the mining area

6. Working with mercury damages your health.

7. As a gold miner, you have a good chance of becoming rich

8. If you know how to use it, mercury is not dangerous

9. As a miner, you might not find any gold the way we mine.

10. Gold mining is not more risky than other work.

11. There is more evil (ogit) in the mining area than there is in the city

## **B Risk seeking versus risk averse attitudes**

- 1 I like gold mining
- 2 When I encounter a snake I will kill it
- 3 I am afraid when I walk alone in the forest
- 4 I don't like to go outside at night
- 5 I like to gamble
- 6 I walk in my room in white fields, swamps
- 7 I run away when I see a snake
- 8 I am afraid when I pass the bridge by foot
- 9 I will fight/protest if the government sells the forest
- 10 I have been involved in gangfight

## **VII. Mining experiences**

- 1 When did you go gold mining for the first time? (year) Where? (open ended)
- 2 How did you get the idea to go mining? (open ended)
- 3 Who took you to the mining area? (open ended)
- 4 In what mining area do you work now? (open ended)
- 5 Have you worked in other mining areas? (0-No, 1-Yes)
- 6 Why do you work as a gold miner? (open ended)
- 7 Does mining pay more than other jobs? (0-No, 1-Yes)
- 8 Where do you call your gold? (open ended)

## **VIII. Future perspectives**

### **gold miners**

- 1 How long do you want to continue mining? (open-ended)
  - 2 When you quit mining, what do you want to do? (open-ended)
  - 3 Do you want your children to become gold miners? (0-No, 1-Yes)
- ### **non-gold miners**
- 1 Do you have any dreams for the future, something you would like to do or have? (open-ended)
  - 2 What do you want your children to do when they grow up? (open-ended)

**APPENDIX E**  
**RAW DATA FOR INTERNATIONAL AND NATIONAL INDICATORS<sup>a</sup>**

**International Indicators**

year	nominal gold price (\$/oz)	nominal oil price (\$/bbl)	US CPI	real gold price (\$/oz)	real oil price (\$/bbl)	ex- change rate	Sov CPI	real gold price (\$/oz 1990 \$)	real oil price (\$/b)
date	a	b	c			d	e		
1959	132.86	1.80	21.64	131.84	76	13.64	6.02	661	71.11
1959	129.20	1.15	26.41	127.98	44	11.90	6.03	664	75.90
1959	79.61	2.46	26.87	77.70	27	11.90	6.04	662	76.77
1959	111.8485	3.14	31.31	104.87	76	11.90	6.07	7147	71.11
1959	121.246	12.41	34.34	120.87	34.85	11.90	6.26	7143	104.81
1959	1281.28	12.88	21.34	483.27	6.12	11.90	6.22	10.90	111.79
1959	188.12	13.47	25.21	174.66	4.78	11.90	6.24	696	104.80
1959	902.80	13.84	41.68	188.82	5.60	11.90	6.26	617	100.07
1959	1268.27	14.34	45.41	177.94	5.48	11.90	6.25	664	10.90
1959	1252.66	21.49	49.06	160.52	5.18	11.90	6.21	711	100.00
1960	2012.26	21.47	51.11	1176.87	16.80	11.90	6.36	1004	10.90
1961	1279.86	22.67	66.47	614.18	26.14	11.90	6.30	636	10.61
1962	982.14	31.49	61.30	622.17	18.66	11.90	6.42	671	10.10
1962	1266.28	29.11	64.96	685.78	12.60	11.90	6.44	620	10.11
1963	851.34	26.47	67.34	568.87	16.28	11.90	6.46	103	11.90
1963	676.34	22.00	65.68	476.30	12.52	11.90	6.50	104	10.10
1964	764.36	14.75	71.50	568.84	9.20	11.90	6.46	103	10.61
1967	166.60	18.05	71.60	622.36	12.40	11.90	6.62	111	10.61
1968	175.13	14.82	76.31	546.50	10.64	11.90	6.66	106	10.61
1969	441.35	16.67	76.60	476.74	10.60	11.90	6.66	111	10.61
1969	266.14	22.32	81.68	476.11	16.28	11.90	6.70	101	10.10
1969	492.11	18.19	86.36	625.68	12.27	11.90	6.71	96	11.90
1969	661.44	16.12	86.71	105.87	11.11	11.90	6.70	96	11.90
1969	617.12	16.49	86.87	604.12	16.71	11.90	6.74	101	10.1
1969	661.09	11.41	93.26	661.12	11.97	11.912	6.70	106	10.61
1969	6024.0	17.11	93.39	602.26	18.69	10.21	67.9	101	10.10
1969	466.11	20.34	91.11	179.21	19.29	10.26	67.2	106	10.60
1967	101.92	16.61	95.68	102.82	17.12	10	67.3	106	10.61
1968	284.13	11.11	101.6	202.70	12.12	10	108	109	10.61
1969	260.79	11.06	106.0			76.6	102	11.1	10.61



## National indicators

year	GPI	unemployment (%)	spineless	SPDR
source	a	b	c	d
1979	6.18	2.5		8
1979	6.18	1.1		9
1979	6.36	1.4		9
1979	6.17	2.2	624	8
1979	6.30	2.4	1.08	9
1979	6.17		1.05	7
1979	6.34	6.2	628	11
1979	6.36	6.2	634	14
1979	6.34	5.6	634	17
1979	6.17	5.8	637	18
1980	6.36	7.7	1.14	28
1981	6.39	6.2	1.08	21
1982	6.42	6.2	981	26
1983	6.44	11.8	882	34
1984	6.46	16.1	677	38
1985	6.47	18.1	664	50
1986	6.49	14.3	654	53
1987	6.51	21.4	664	68
1988	6.53	20.7	674	67
1989	6.55	17.1	683	61
1990	1.14	1.21	684	70
1991	1.21	10.1	686	76
1992	1.19	10.2	683	86
1993	1.24	14.7	685	95
1994	21.00	10.7	1.80	103
1995	21.80	9.4	1.45	102
1996	21.81	10.89	1.62	112
1997	21.17	10.89	1.65	118
1998	20.00		1.21	123
1999	17.00			128

<sup>1</sup> Data for 1999 are calculated up to August

## Data Sources

a. US Geological Survey (press. note, February 1993). Most recent monthly rates that were used for 1998–August 1999 are available at <http://www.kitco.com/gold-history/>

b. United States, Energy Information Administration, January 1999.

Originally published by the Department of Energy's Office of the Strategic Petroleum Reserve, Analysis Division. Updates for 1993, 1996, 1997, and 1998 are from the Energy Information Administration.

c. US Green Economic Product Implicit Price Deflator, which is available at <http://www.econregisr.com/> (last = 1998).

d. Exchange rates for conversion of US\$ to S\$ from IMF International Financial Statistics Yearbook.

e. General Bureau of Statistics, Sectoral Consumer Price Indexnumbers (A/SB 1997: 36), data on 1997 from A/SB (1998a), data on 1999 from IMF (1999).

f. Unemployment 1990–1999 – LN Statistical Yearbook (conversions to % by the author), 1990–1997: Central Bureau of Statistics, Table B-2, Pp 43 (A/SB 1997), 1998–1999: Montsalviu at Sarriena 1999–1997, Sarriena in Figure 9 (B) 1998/99 (A/SB 1998a, C1.8, 38).

g.  $Openings = Imports + Exports/GDP$ . Rates were obtained from IMF International Statistical Yearbook.

h.  $SPM = \text{number of persons who newly entered gold mining in a given year} \div \text{number of persons who quit gold mining in a given year}$  using survey data from upper-Tanzanian region.

## APPENDIX B MEASURING RISK TOLERANCE

The initially constructed Likert scale contained 18 statements regarding the physical risks that Nepalis confront regularly. During the first six weeks of fieldwork, I used the responses of 61 test-observations to test the scale for face validity. I corrected the scale by deleting some statements, and adding or reformulating others, based upon my impression of how well the statements measured risk tolerance (Bryman and Burgess 1999). Correcting the scale in the field allowed me to return to people, and to make sure that the people in the test-sample responded to the corrected questions. This procedure allowed me to exclude people from the test sample in the final sample.

The corrected statements that were administered are listed in Section VI b of the Survey Protocol that appears in Appendix D. A total of 283 people responded to the adjusted scale, which like the original scale contained 18 items. I used the results for the complete sample to test for validity and reliability. Statements 5 ('I like to gamble') and 10 ('I have been involved in gun fights') were omitted because practically none of the participants had these experiences. I tested the eight behavior statements for internal reliability using the Cronbach's alpha procedure and factor analysis (Bernard 1993, Bryman and Burgess 1999). Reliability refers to the internal consistency or uniformity of the scale. A scale is reliable if all answers measure a single idea (Bernard 1993). The results from these tests made me delete the items that produced the most error (keeping statements 1, 3, 6, 7 & 8). The final scale of personal tolerance towards physical risk contains 3 items and is reliable (alpha = 0.87). There is one more factor underlying the scale, reflecting uniformity of the scale.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy

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This dissertation was submitted to the Graduate Faculty of the Department of Anthropology in the College of Liberal Arts and Sciences and to the Graduate School and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

August 2008

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